Volume 2 NOVEMBER, 1923 Number 11

# JOURNAL

OF THE

# AMERICAN WELDING SOCIETY

Published Monthly by the American Welding Society
33 West Thirty-ninth Street, New York

# American Welding Society

## OFFICERS FOR 1923-24

T. F. Barton, *President*
C. A. McCune, *Treasurer*
M. M. Kelly, *Secretary*
Wm. Namack, *Vice-President*
T. F. Oechsle, *Vice- President*
W. A. Slack, *Vice-President*
A. V. Thompson, *Vice-President*
C. L. Jones, *Vice-President*

## DIRECTORS

(Officers listed above are also members of the Board of Directors)

| *Term Expires 1924* | *Term Expires 1925* | *Term Expires 1926* | *Section Representatives* |
|---|---|---|---|
| A. S. Kinsey | James Burke | C. A. Adams | Eric Ewertz |
| J. C. Lincoln | A. F. Jenkins | A. M. Candy | R. D. Malm |
| H. L. Nicholson | Hermann Lemp | C. J. Holslag | J. A. Seede |
| E. M. T. Ryder | H. I. Walsh | H. S. Smith | A. M. Candy |
| H. R. Swartley | S. W. Miller | C. A. McCune | J. W. Morrisey |
| E. Vom Steeg | | | |
| E. Wanamaker | | | |
| J. H. Deppeler | | | |

## PAST-PRESIDENTS

C. A. Adams, (1919-20)
J. H. Deppeler (1920-21)
S. W. Miller (1921-22)
C. A. McCune (1922-23)

## CHAIRMEN, STANDING COMMITTEES

*Executive*—T. F. Barton
*Finance*—C. A. McCune
*By-Laws*—Hermann Lemp
*Meetings and Papers*—A. G. Oehler
*Membership*—L. B. Mackenzie

W. Spraragen, *Editor, Journal*

# American Bureau of Welding

(RESEARCH DEPARTMENT OF SOCIETY)

## OFFICERS

C. A. Adams, *Director*
H. M. Hobart, *1st Vice-Director*
A. S. Kinsey, *2nd Vice-Director*
Wm. Spraragen, *Secretary*

## CHAIRMEN, RESEARCH COMMITTEES

*Electric Arc Welding*—H. M. Hobart
*Gas Welding*—S. W. Miller
*Welding of Storage Tanks*—J. C. Lincoln
*Pressure Vessels*—H. L. Whittemore
*Standard Tests for Welds*—F. M. Farmer
*Welding Wire Specifications*—C. A. McCune
*Training of Operators*—J. C. Wright
*Resistance Welding*—Hermann Lemp
*Thermit Welding*—J. H. Deppeler
*Welded Rail Joint*—G. K. Burgess
*Specifications for Iron and Steel to be Welded*—W. J. Beck

# JOURNAL
## OF THE
# AMERICAN WELDING SOCIETY

Copyright 1923 by the American Welding Society,
33 West Thirty-ninth Street, New York.
Subscription $10.00 per year to United States. $11.00 to Canada. Libraries $5.00
Back numbers, per copy: Members, $.50; Non-members, $1.00.

The Society is not responsible for any statement made or opinion expressed in its publications. Permission is given to reprint any article after its date of publication, provided proper credit is given.

Volume 2 NOVEMBER, 1923 Number 11

## TABLE OF CONTENTS

SOCIETY AND RELATED ACTIVITIES Page

Fall Meeting . . . . . 3
Past President C. A. McCune . . . . . 5
Annual Convention, International Acetylene Association 5
Welded Rail Joint Committee Exhibition . . . . . 5
General Interest in Section Meetings . . . . . 6
Picture of Westinghouse Inspection Trip . . . . . 7
New Members . . . . . 11
Attendance at Fall Meeting . . . . . 11
Employment Service Bulletin . . . . . 13

TECHNICAL PAPERS, ITEMS AND REPORTS

Welding and Insurance . . . . . 14
Oxy-Acetylene Welding of Coal Dryer . . . . . 25
Arc Welding of Fuel Oil Tanks . . . . . 29
Reclamation on Southern Pacific . . . . . 30
Repairing of a Large Plate Roll . . . . . 32
Current Welding Literature . . . . . 33

## SECTION OFFICERS AND HEADQUARTERS

### PHILADELPHIA

*Engineers' Club, 1317 Spruce Street, Philadelphia, Pa.*

Chairman—Theo. F. Oechsle, Consulting Engineer, David Lupton's Sons Co.
Secretary—A. Schroeder, Standard Electric Welding Company.

### CHICAGO

*Peoples Gas Building, Chicago.*

Chairman—H. A. Austin, Mfg. Oxygen and Hydrogen.
Secretary—Stuart Plumley, Editor, Acetylene Journal Publishing Company.

### PITTSBURGH

*1841 Oliver Building, Pittsburgh.*

Chairman—J. D. Conway, Secretary-Treasurer, Railway Supply Mfg. Association.
Secretary—H. E. Hollis, P. O. Box 681, Pittsburgh, Pa.

### NEW YORK

*33 West Thirty-ninth Street, New York*

Chairman—E. H. Ewertz, Bethlehem Shipbuilding Co., Elizabeth, N. J.
Secretary—M. R. Feeley, Delaware, Lackawanna & Western RR., Hoboken, N. J.

### NORTHERN NEW YORK

*Room 407, Building 2, General Electric Company, Schenectady.*

Chairman—H. M. Hobart, General Electric Co., Schenectady, N. Y.
Secretary—W. L. Warner, General Electric Co., Schenectady, N. Y.

### CLEVELAND

*2300 Chester Avenue, Cleveland, Ohio.*

Chairman—J. C. Lincoln, Lincoln Electric Company.
Secretary—R. K. Randall, Dean, Welding School, Cleveland School of Technology.

### SAN FRANCISCO

*Rialto Building, San Francisco.*

Chairman—J. C. Bennett, Assistant Engineer, Associated Oil Co., San Francisco.
Secretary—W. B. Sawyer, Jr., United States Steel Products Company.

### LOS ANGELES

*451 East Third Street, Los Angeles*

Chairman—L. J. Smith, District Sales Manager, The Ideal Electric & Mfg. Company.
Secretary—E. W. Crane, E. E., 1119 Santa Fe Avenue, Los Angeles.

### BOSTON

*Engineers' Club, 2 Commonwealth Avenue, Boston, Mass.*

Chairman—Thomas A. Wry, General Electric Company, Lynn, Mass.
Secretary—J. W. Morrissey, P. F. McDonald & Company, Boston, Mass.

AMERICAN WELDING SOCIETY
ESTABLISHED 1919
JOURNAL

Volume 2 NOVEMBER, 1923 Number 11

## Fall Meeting Huge Success

The fall meeting of the American Welding Society held in Fort Pitt Hotel, Pittsburgh on October 24th to 26th was one of the most successful since the organization of the Society four and a half years ago. The wisdom of the handful of men responsible for its origin at that time is attested by the number and character of the men that attended this meeting. Busy executives and managers of large corporations felt it worth while to leave their business and travel great distances to attend these sessions. Fully 15 per cent. of the out of town members of the Society were present at this meeting among whom were included representatives from nearly all of the local sections of the Society.

These sessions brought out the fact that the applications of welding have more than trebled during the past two years and that due largely to the efforts of the Society there is a spirit of cooperation between competitive manufacturers as well as users that tends towards progress. The meeting was formally launched with an adress of welcome by Mr. J. D. Conway, Chairman of the Pittsburgh Section on Wednesday morning. He was followed by President T. F. Barton who presented a general statement of the Society affairs. An abstract of Mr. Barton's address was printed in the October issue of the Journal. The President pointed out that the Society enjoys the cooperation of the leading manufacturers of welding apparatus as evidenced by their support to the Society in the way of membership, advertising and adoption of standards. Although the finances of the Society are in a good condition further progress and growth can only be made through increased revenue. While the Society has to its credit many achievements still greater accomplishments can be looked forward to if this additional support is forthcoming.

Mr. A. G. Oehler, Chairman of the Meeting and Papers Committee presented a report on the "General Interests Shown in Section Meetings." He pointed out a number of ways in which greater interest and greater attendance could be secured at these local meetings. The report was followed by a general discussion by those present and the views of representatives of the different sections were obtained. The topics of discussion included the Journal, membership activities and general promotion of welding.

Wednesday afternoon was given over to the Industrial Application Session. Mr. E. H. Ewertz, General Manager of the Moore Plant, Bethlehem Shipbuilding Company read a report on the "Industrial Applications of Welding and Cutting and Their Possibilities." This session was attended by the executives of many of the leading industries of Pittsburgh and vicinity. The report consisted of a comprehensive review of the applications of electric arc, gas, resistance and thermit welding. The possibilities of these several processes and the resulting savings which could be affected by their application in industrial work was clearly indicated. Welding and riveting were compared in detail as methods used in fabrication of iron and steel. Taken together the several welding methods, for the study and development of which the American Welding Society was organized, constitute one of the most important far reaching and labor saving processes ever invented. The possibilities of further application are even greater than the present ones. The report was illustrated by a large number of slides showing the applications of welding in repair work, construction and routine manufacturing applications. At the conclusion President Barton outlined the

relation of the Society to the Industry and the confidence which the Industry now has in the Society as evidenced by its support and by the affiliations with some of the foremost national organizations in the country such as the National Research Council, American Electric Railway Association, American Society of Mechanical Engineers and the Federal Board for Vocational Education. He was followed by Mr. W. Spraragen, Secretary of the American Bureau of Welding (Research Department of the Society), who is also Secretary of the Division of Engineering, National Research Council. Mr. Spraragen briefly reviewed the many reports gotten out by the Bureau and as examples of cooperative work referred particularly to the work of the Pressure Vessel Committee involving a program of investigation amounting to $15,000 and the work of the Welded Rail Joint Committee amounting to some $80,000. The relation of the National Research Council to this investigational work was also brought out.

Wednesday evening was given over to the fall dinner of the Society. These dinners have become a special feature of the fall and annual meetings of the Society and are looked forward to by all the members. The unique feature of this particular meeting was the unusual entertainment features made possible through Mr. J. D. Conway, Chairman of the Pittsburgh Section.

The Electric Arc Welding Committee held a meeting on Thursday Morning. About forty people were in attendance. Mr. W. L. Warner reported that the standards for Arc Welding Apparatus originally compiled by the Electric Arc Welding Committee under the Chairmanship of W. Spraragen had been revised by a Sub-Committee of the A. I. E. E. under the chairmanship of Mr. F. M. Farmer. These revised Standards had undergone further revision by a sub-committee under the chairmanship of Mr. H. M. Hobart. Copies of this last draft of the Standards for Arc Welding Apparatus were distributed to members of the Committee with a request that they submit revisions to Mr. Hobart. A digest of the available information on the "Application of Arc Welding to Shipbuilding" prepared by Mr. E. H. Ewertz, under the direction of the Committee is being printed as a serial in "Marine Engineering." The report includes a description of all the welded ships, a number of photographs, test results, cost data, discussion of design and other information. Mr. A. G. Bissell of the Westinghouse Elec. and Mfg. Co. presented a report embodying a digest of the existing information on the welding of non-ferrous metals. Members of the Committee were requested to go over the report carefully and submit comments to the Secretary. Progress was reported by the subcommittees dealing with the reviews of welding thin sheet metal and speed and cost of arc welding and also the preparation of specifications for specimens to secure data on the arc welding of steel for structural purposes.

At a joint meeting between the Executive Committee of the American Bureau of Welding and the Board of Directors of the American Welding Society on Thursday morning, it was voted to appropriate $150 to crate and ship some six tons of samples now located at the Electrical Testing Laboratories to Union College where they will be tested. This series of tests was started during the War to determine certain fundamentals of arc welding but were never completed because of lack of funds. It was also decided to publish a Directory of the membership of the Society.

Thursday afternoon was given over to an inspection trip through the plants of the Westinghouse Elec. and Mfg. Co. Through the courtesy of this Company transportation was provided from Pittsburgh to the plant of the Company where members of the Society and their guests were served with an excellent luncheon and later guided through the shops of the Company and thus afforded an opportunity to see the methods employed by one of the largest manufacturers of electric apparatus and supplies in the country. Nearly everywhere could be seen applications of welding with a resulting economy of cost and better quality of output.

Members of the American Welding Society were invited as guests at the annual meeting of the Pittsburgh Railway Club on Thursday evening and enjoyed the special entertainment features for which the Club is famous. This meeting served as an inspiration to the members of what might in a few years be expected from the American Welding Society.

A meeting of the Gas Welding Committee was held Friday morning and a progress report was presented on the digest of available information

on the welding of pipe lines. Several suggestions were made for amplification and revision of this report.

A meeting of the Committee on Training of Operators was also held on Friday morning and at this session the training course for Electric Arc Welders was completed. The course on the Training of Oxy-Acetylene Welders, prepared by the Committee, was published in the April 1923 issue of the Journal.

Friday afternoon was given over to an inspection trip of the Carnegie Steel Plant at Homestead. About sixty members of the Society took advantage of this opportunity to witness the operation of a large steel mill. The welding shop was also inspected by members and they had and opportunity to see first hand how the applications of welding in this steel plant is resulting in saving of thousands of dollars.

The fall meeting was concluded with a joint meeting of the Society with the Pittsburgh Section. The session was opened by a brief review of the technical work of the Society by Mr. W. Spraragen and was followed by a presentation of the activities of the Society and its standing in the industrial world by President Barton. Dr. A. D. Risteen, Director of Technical Research of Travelers Insurance Company explained the attitude of the insurance company towards gas and electric welding. His address briefly reviewed the relation between welding and insurance in the past, recognizing the important progress that has been made in the welders art and gave assurance that the welding fraternity in its efforts to improve welding practices will have the whole-hearted support of the insurance companies. Mr. George D. Ogden, Traffic Manager, Pennsylvania System, Pittsburgh who is also the newly elected President of the Pittsburgh Railway Club presented a brief report on the railroad situation.

---

## PAST PRESIDENT C. A. McCUNE, HONORED

At the opening session of the Fall Meeting, President T. F. Barton presented Mr. McCune with a gold pin which also bore the legend "President 1922-3." Mr. Barton pointed out that no one has worked harder to make the Society the success it now is than Past President McCune. We still have his loyal support through membership on many of the Committees of the Society and also as Treasurer.

---

## ANNUAL CONVENTION INTERNATIONAL ACETYLENE ASSOCIATION

The annual convention of the International Acetylene Association will be held in Chicago, Hotel Sherman, November 14th to 16th. Members of the American Welding Society are cordially invited to attend and are promised a hearty welcome at all sessions at the Convention. The business program of this year is unusually good and of interest to all members as is also the entertainment and banquet features.

---

## WELDED RAIL JOINT COMMITTEE STAGES EXHIBITION

One of the exhibitions that attracted wide attention at the recent convention of the American Electric Railway Association was that of the Welded Rail Joint Committe. Sample joints broken up to determine the "present state of the art" were exhibited. This afforded Engineers an opportunity to see how the different joints failed under a particular kind of stress. In addition photographs were shown of the test joints made up in the track by the various street railway companies all over the country and joint manufacturers who are furnishing test joints for the Committee. Summaries of the test data obtained by the various laboratories from the conductivity, tensile, drop and bend tests were also on display. A photograph was also shown of the repeated impact testing machine designed and built by the Committee to give test joints impact blows of a magnitude equal to that given by a trolley car in passing over a cupped joint. A design of a suitable support for test joints in this machine is now under way.

The meeting of the Committee held on Wednesday, October 10th was well attended and included about forty people from all over the country. It is expected that the complete program for determining the "present state of the art" will be completed within the next few months and a program for the future investigational work laid out.

# General Interest in Section Meetings

**A. G. Oehler**

(Chairman Meetings and Papers Committee)

The principal function of the several sections of the American Welding Society is ostensibly to contribute valuable technical data to the industry. They also exert what is perhaps a more important influence because of the getting together of the users of the different processes and different applications of welding. In this way, and with the cooperation of the representatives of welding supply manufacturers, they become clearing houses for improved methods and practices. The fact that much of this clearing house activity is informal and does not appear in the Journal of the Society, does not detract from its value.

The success of the sectional meetings is dependent largely upon the programs and this subject is one which is in need of more consideration than it has been given in the past. In other and older societies the most popular type of program is one that deals with several different phases of the subject. In this case the presentation would be made by two or more representatives of different welding applications. The attractiveness of such a program lies not alone in the fact that a wider appeal is made to the different interests represented by the membership, but also because many of those who are best qualified to address a club, from the standpoint of knowledge and experience, have had little or no training in public speaking and cannot hold an audience for any great length of time. Using three or four speakers for short periods tends to hold up the interest on the part of the audience and makes the meeting more attractive. It must be remembered also that most members are desirous of getting a wider knowledge of welding in general, and if talks are snappy and to the point and not too long, those in attendance will follow them with just as great interest as if they were listening to a highly specialized presentation covering their own particular work.

Another type of program which is popular in many societies is one in which a more general topic, which applies to all departments is presented. An example of such a subject is to be presented to the Society in the paper on Welding and Insurance Friday evening, October 26.

Motion pictures have been welcomed by all societies. In these days of elaborate moving picture houses, with excellent musical programs and appointments, it would almost seem as if little attention would be given by society members to the showing of a film relating to some technical feature. The technical films are usually not as clear-cut and attractive as the educational films prepared for showing to the general public and frequently it is difficult to secure the best conditions for reproducing pictures in the meeting halls used by the sections. In spite of these conditions and limitations, however, there can be no question but that such films make a strong appeal to members.

One of the greatest assets a section can have is a bunch of boosters. Welders have the same social instincts as any other class of human beings and they like to be associated with organizations that hum with activity and are doing real things. The success of a section can be measured by the spirit in which the members enter into the activities. A group of men who will welcome the members and study the situation in order to mix up the members and get them to participate in the society activities is a real asset.

To get more specific information on the subject a questionnaire was sent out to the membership requesting suggestions on conducting the section meetings. Many valuable suggestions and promises of cooperation were received. Taken as a whole, however, the answers show a wide divergence of opinion regarding what a program should consist of.

For example: one man says let us have "Topical Discussions" consisting of a meeting where there is no set program and the subject is assigned to someone to open, after which discussion is had by those present.

Another man says, "Have papers or talks that impart information or knowledge freely and are not intended merely to invite or provoke discussions whereby the author of the paper may gain knowledge he does not have when he presents the paper. Make the author give something before ideas and information are given to him. Cut out the fishing expeditions."

Group of members of the American Welding Society on an inspection trip through the plants of the Westinghouse Electric and Manufacturing Co., East Pittsburgh, in connection with the Fall Meeting of the Society.

In another case the officers of the section are considered inefficient by the members. Probably the best way to meet this difficulty is to include all such conscientious objectors in the membership of the several committees so that they can see exactly how things are managed and so that they are in a position to render the society some sort of personal service.

The great divergence of opinion expressed by the members in answering the questionnaire makes it impractical to compile the answers, prepare a weighted average result and say, "This is what is wanted." Arranging and conducting successful meetings is an age old problem which has many angles.

It is of fundamental importance that the members are disabused of a more or less prevalent idea that the society is trying to exploit them. Better acquaintance among the members and better understanding of the aims and activities of the society will show members that their attendance at meetings is a duty both to themselves and the society.

Due to the fact that there are so many different interests, it is necessary in each locality to establish a basis of operation for running meetings that will work well and will suit a majority of the members.

Successful meetings are the foundation upon which the society rests and too much attention cannot be given to them. Good programs announced sufficiently far in advance will bring out members.

With this in mind a joint meeting of the executive committee and the meetings and papers committee of the Metropolitan Section was held recently in New York and it is suggested that the matter be given attention in the same way in all sections instead of leaving the matter entirely with the chairman of the meetings and papers committee.

Conditions in each section differ and require special attention, but the suggestions made at the recent joint meeting in New York are included herewith for the consideration of others who may wish to adopt them:

1. The presentation of motion pictures or of a paper well illustrated with lantern slides.

2. A program consisting of two or more short papers rather than one long one.

3. A get-together evening at which the members are provided with cider and smokes.

4. A program consisting of one paper and the showing of four or five slides on different subjects unrelated to the paper. These slides can be made up by the society from photographs which members have taken of work they have done. It is of course desirable to have the men who did the work shown on the slides in attendnace to answer questions. Similarly it is considered important that whenever a program is such as to encourage questions on a specific subject, those in charge of the meeting should see to it that some person is there who can answer the questions. Without this prearrangement, a pointless and profitless discussion is apt to ensue.

5. At times instead of meeting at the regular place, hold a meeting in some manufacturing plant or welding shop. An inspection trip through the plant or shop can be followed by a meeting there at which the members can ask questions about what they saw in the shop. This suggestion is endorsed by treasurers as the cost of the meeting room is eliminated.

6. Once or twice a season arrange the chairs in a circle around the chairman or speaker to dispose of the apparent formality of the meting. At such a meeting have the chairman call upon members to stand and attempt to call those present by name. This would be embarrassing to many but volunteers can be found if necessary before the meeting is called to order and the effort is almost sure to accomplish its purpose in dispelling formality.

7. Joint meetings with other Societies at which papers are presented of interest to both.

8. Presentation of a paper by one speaker supplemented by several of the welders who performed parts of the work described.

---

## A WORD OF APPRECIATION

There can be no question but what the success of the fall meeting of the Society recently held in Pittsburgh was in a large measure due to the painstaking efforts of Chairman J. D. Conway of the Pittsburgh Section. No task was too hard or too trivial for him to do if it contributed in the smallest measure to the comfort of the members and their entertainment. Members who were fortunate enough to be able to attend this fall meeting will not soon forget the courtesy shown by the Chairman of our Pittsburgh Section.

Mr. H. E. Hollis, Secretary of the Section rendered invaluable aid in arranging for the numerous details involved in a program of activities such as our Fall Meeting. If members of the Pittsburgh Section get together and render their whole hearted support to these two officers there can be no question of the success of the Section.

## EMPLOYMENT SERVICE BULLETIN

During the past year and a half the American Welding Society has been conducting an employment service bulletin. In order to make this bulletin effective it is necessary that members make the maximum use of same. Employers of welding talent should keep the Society in touch of any openings in their staff and the Society will in turn furnish the names and addresses and record of experience of those members who are available and who have the requisite qualifications. In order to be able to do this, however, welders, supervisors, engineers and salesmen should keep the Society informed when they are available for a new position and at the same time furnish us with a brief record of their experience. This service is free to both employer and employee.

## SECTION ACTIVITIES

### Philadelphia

The next meeting of the Philadelphia Section will be held on November 19th. Mr. J. Meadowcroft of the E. J. Budd Manufacturing Co. will present a moving picture showing the "Making of Steel Automobile Bodies." This is the first time this picture has been taken out of the plant of the Company. Mr. Meadowcroft will explain the picture as it is being shown.

### Cleveland

The first meeting of the 1923-4 Season of the Cleveland Section was held Wednesday evening October 17th at the Hotel Winton. Two very interesting talks were delivered on the subject of cutting. Mr. George O. Carter of the Linde Air products Company read a paper on "Scrapping of Battleships by Oxy-Acetylene Cutting." Slides were shown of the cutting up of the Battleships U. S. S. Ohio and Kentucky. Mr. C. C. Peck of the Lincoln Electric Company gave an interesting talk on the use of carbon arc for cutting purposes and exhibited several samples of the work done by this process. Mr. A. G. Bissell of the Westinghouse Electric & Mfg. Co., Pittsburgh, gave a brief address on the necessity of procuring operators who were conscientious and whose work could be relied upon.

### New York

The first meeting of the season will be held on Tuesday, November 13th, in the Engineering Societies Building. Mr. W. H. Bleeker of the Page Steel and Wire Company will present an address on "Manufacturing Commercially Pure Iron and Steel." The talk will be illustrated with moving pictures and lantern slides which will include a trip to an openhearth, blooming mill, rolling mill and wire mill, and will show all steps in the manufacturing of wire beginning with the ore. Mr. P. P. Pipes, Welding Engineer of the Lincoln Electric Company will give a short talk on "Arc Welding of Fuel Tanks." He will be followed by Mr. C. J. Holslag of the Electric Arc Cutting and Welding Company, who will discuss the "Relative Fields of Electric, Gas and Thermit Welding." President T. F. Barton of the Society and Master Mechanic of the D. L. and W. R. R. will present a review of what happened at the fall meeting of the Society in Pittsburgh. The meeting will be presided by the Chairman of the Section, Mr. E. H. Ewertz,, General Manager, Moore Plant, Bethlehem Shipbuilding Corporation. Smokes and refreshments are also included on the program.

The December meeting of the New York Section will be held on December 11th at which time Mr. C. F. Gailor, Consulting Engineer, will present a paper on the welding of copper to steel and the possibilities opened up by the successful joining of these metals by the electric arc such as for example the possible welding of cast iron by copper electrodes.

**Boston**

The first regular meeting of the Boston Section was held on October 19th. The meeting was presided by Mr. T. A. Wry, General Electric Company, Lynn, Mass., Chairman of the Section. Mr. Winsor the first speaker spoke briefly on the problems and compensation of the job welding shop. He pointed out that in order for the present day job welding shop to be successful it was necessary to manufacture some routine welded products as a part of its regular work. Papers were then presented on arc, gas, resistance and thermit welding by Messrs. Malcoln Thomson, P. E. Wilder, H. A. Woofter and R. L. Browne, respectively. These papers were discussed by those present. A plan of activities for the coming year was also reviewed.

**Northern New York**

The extraction of oxygen from the air was explained and illustrated in Edison Hall at the sixteenth meeting of the Section on October 12th by Professor A. S. Kinsey, Advisory Service Engineer of the Air Reduction Sales Company, the subject being the "Uses of Oxygen and Acetylene in Engineering Practice."

In his lecture Professor Kinsey dwelt on the manufacture of oxygen from the air, illustrating his remarks by actual views in an oxygen manufacturing plant and by animated mechanical diagrams. He followed this by a discussion of the manufacture of calcium carbide, including the quarrying of limestone, the fusion of coke and limestone in an electric furnace and the crushing of the calcium carbide. From this he passed to the manufacture of acetylene from calcium carbide and the compression and storage of acetylene in specially packed steel cylinders. He concluded his remarks by giving some practical applications of oxyacetylene welding in industrial and railroad plants, and of oxyacetylene cutting of metals in industrial and railroad shops.

The motion picture film, "Oxygen —the wonder Worker," aroused much interest. This demonstrated and explained the ease with which the oxyacetylene torch has helped reduce several of the country's battleships to scrap metal. The extraction of oxygen from the air and the cutting of steel by this element was illustrated. The film, produced by the United States Bureau of Mines in co-operation with the Air Reduction Sales company, was in four reels. It showed how liquid air is made; why it is possible to separate the gases of the atmosphere; how oxygen is extracted from the air; how the high temperature (6,300 degrees degrees farenheit) of the oxyacetylene flame is produced; how carbide is made and acetylene gas formed; how iron, steel and cast iron are cut, and how welding and cutting operations of great economical value are performed in some of the country's important industrial plants and railroad shops.

**Chicago**

A regular meeting of the Chicago Section was held Friday, October 5th in the rooms of the Western Society of Engineers. About 60 members were present. President Barton addressed the Section upon the activities of various local sections and the relation of headquarters to the sections. Mr. A. F. Dillon of Fort Wayne, Indiana presented a paper on "Locomotive Frame Welding." Mr. J. I. Banash talked upon the subject of "Sanity in Welding." The next meeting of this section will be held on Friday, November 2nd in the rooms of the Western Society of Engineers.

**Pittsburgh**

A meeting of the Pittsburgh section was held in conjunction with the fall meeting of the American Welding Society on Friday, October 26th. Further details of this meeting are given elsewhere in this Journal under the report of fall meeting of the Society.

**San Francisco**

The first meeting of the San Francisco Section was held on September 21st. Mr. E. J. Becker, General Inspector of Stores, Southern Pacific Company presented an extremely interesting three reel motion picture on the subject of "Reclamation of Material on the Southern Pacific System."

In addition to the picture Mr. Becker also gave some interesting figures and facts on this phase of welding.

## New Members for Months of July, August & September

### CHICAGO

Owen L. Howland, Welding Engr., Central Steel & Wire Co., 127 No. Peoria St., Chicago, Ill. B

Edw. F. Potter, Salesman, Central Steel & Wire Co., 127 No. Peoria St., Chicago, Ill B

### NEW YORK

Chas. Michaels, President, Michaels & Mourre, Inc., 10210 Grand Ave., East Elmhurst, N. Y. B

Everett Moses, Special representative in N. Y. C., Oxweld Acetylene Co., Long Island City, N. Y.

Richard J. Niebanck, Jr., draftsman, Air Reduction Sales Co., 46 Goutier Ave., Jersey City C

B. H. Davis, Master Mechanic, Del. Lack. & Western R. R., Scranton, Pa. D

### NORTHERN NEW YORK

Lucian B. Thompson, Arc Welder, General Electric Co., Schenectady, New York D

### PHILADELPHIA

J. Stewart Huston, Asst. Metallurgist, Lukens Steel Co., Coatesville, Pa. B

Joseph E. Sullivan, General Foreman of Machine Shop, Westinghouse Elec. & Mfg. Co., Phil., Sub-station, Phil., Pa. B

Chas. Kalwinski, Foreman of Welding Dept., Westinghouse Elec. & Mfg. Co., So. Phil., Sub-station, Phil., Pa. C

Emmitt A. Creasy, Welder, Danville Iron & Steel Corp., Danville, Pa. D

### PITTSBURGH

E. L. Shaffer, Salesman, Page Steel and Wire Co., Pittsburgh, Pa. B

### SAN FRANCISCO

Thos. W. Brooks, Salesman, U. S. Steel Products Co., Rialto Bldg., San Francisco C

C. S. Smith, Dist. Sales Manager Linde Air Products Co., 506 Balfour Bldg., San Francisco C

L. D. Jurs, Chief Engineer, Associated Oil Company, 79 New Montgomery St. San Francisco D

### SOCIETY

E. P. Fairchild, Master Boiler Maker, Atlantic Coast Line RR. Waycross, Ga. C

Wm. C. Hays, Welding Foreman, Atlantic Coast Line RR, Waycross, Ga. C

John B. Michael, Master Mechanic, Southern Railway Company, Selma, Alabama C

Benj. F. Poarch, Welder, Shearer Machine Co., 294 Hill St., Atlanta, Ga. C

P. W. Whitaker, Supt. Machine Shops, Gypsy Oil Co., Tulsa, Okla. C

Joseph Wm. Arnison, Welder, Benoni Weld. & Cutting Co., Benoni, Transvaal, So. Africa D

Guy W. Bottorff, Arc Welder, L. & N. Railway Co., South Louisville, Ky. D

C. F. W. Runge, Welding Foreman, Chile Exploration Co., Chile, South America D

R. F. Scott, Chief Electrician Atlantic Coast Lumber, Corp., Georgetown, S. C. D

---

## List of Members Attending Fall Meeting of Society

Below is given a list of the members of the Society that attended the fall meeting. The list only includes those who registered.

Austin, F. S., Gen'l Sales Mgr., Carbo Hydrogen Co., Pittsburgh, Pa.

Boyd, W. R., Engr. Welding Dept., Burke Electric Company, Erie, Pa.

Brownall, G. C., Div. Service Engineering, American Rolling Mill Co., Middletown, Ohio.

Beck, W. J., Director of Research, American Rolling Mill Co., Middletown, Ohio.

Bissell, A. G., General Engineer, Westinghouse Elec. and Mfg. Co., E. Pittsburgh, Pa.

Barton, T. F., Master Mechanic, D. L. and W. R. R., Kingsland, N. J.

Bates, C. W., Research Engineer, Philadelphia Electric Company, Philadelphia, Pa.

Bruckner, R. E., Sales Engineer, U. S. Gauge Company, New York City

Conway, J. D., Chairman Pittsburgh Section, American Welding Society, Pittsburgh, Pa.

Copeland, T. F., Res. Eng., Carnegie Steel Company, Munhall, Pa.

Candy, A. M., Gen'l Engr., Westinghouse Elec. and Mfg. Co., E. Pittsburgh, Pa.

Deppeler, J. H., Chief Engineer, Metal and Thermit Corp'n, Jersey City, New Jersey.

Dickman, J. F., Welder, P. R. R., Camden, N. J.

Deyoe, D. H., Electrical Engineer, General Electric Co., Schenectady, New York

Ewertz, E. H., Gen'l Mgr., Bethlehem Shipbuilding Corp'n, Elizabeth, N. J.

Evans, Oscar, Electrician, Republic Company, Russelton, Pa.

Frazier, L. E., Metallurgist, Page Steel and Wire Co., Monessen, Pa.

Flock, J. B., Gen'l Mgr., Lincoln Electric Company, Pittsburgh, Pa.

Fisher, R. C., Welding Foreman, General Electric Company, Fort Wayne, Indiana

Fyke, F. C., Engineer, Standard Oil Company, Elizabeth, N. J.

Gibb, W. H., President, Gibb Instrument Co., Bay City, Michigan

Ham. H. J., Supt., John A. Roebling Sons Co., Trenton, N. J.

Hoffman, W. G., Combust. Engr., Jones and Laughlin Corp'n, Pittsburgh, Pa.

Hollis, H. E., Secy. and Treas., A. W. S., Pittsburgh Section, Pittsburgh, Pa.

Holslag, C. J., Chief Engineer, Electric Arc Cutting and Welding Co., Newark, N. J.

Hoffman, R. S., Supt. of Shops, Stanadard Oil Company, Elizabeth, N. J.

Hanlon, N. D., Hanlon and Wilson, Wilkinsburgh, Pa.

Kelley, H. D., Metal and Thermit Corp'n, Pittsburgh, Pa.

Lowe, Graham, Dist. S. M., International Oxygen Co., Verona, Pa.

Lord, Harry A., Dist. Mgr., American Rolling Mill Co., Pittsburgh, Pa.

Lindsey, E. R., Ry. Service Dept., Canadian L. A. Co., Montreal, Quebec

Leeper, Jas. A., Foreman, Westinghouse Air Brake Co., Wilmerding, Pa.

Little, W. O., Engineer, Gibb Instrument Co., Bay City, Michigan

McLean, D. D., Supt. Inspr., Travelers Ins. Co., Pittsburgh, Pa.

McKay, W. F., Chief Engineer, International Oxygen Co., Newark, N. J.

Morrissey, J. W., P. F. McDonald & Co., Boston, Mass.

Muir, W., Welder, Carnegie Steel Company, Homestead, Pa.

Meadowcroft, J. W., Gen'l Supt., E. G. Budd Mfg. Co., Philadelphia, Pa.

McDonnell, M. E., Chief Chemist, Penna. System, Altoona, Pa.

Mercer, B. F., Gen'l Foreman, Union Steel Casting Co., Pittsburgh, Pa.

Meddings, A. T., P. R. R., Camden, N. J.

Mann, S. W., Elect. Engr., H. Kleinhaus Co., Pittsburgh, Pa.

McCune, C. A., Sales Engineer, Page Steel and Wire Co., Bridgeport, Conn.

Mason, Robt. S., Welding Foreman, A. T. and S. Fe. Ry., Chicago, Ill.

Oehler, A. G., Editor, Ry. Electric Engineer, New York.

Owens, J. W., Asst. Elec. Engineer, U. S. Navy Yard, Norfolk, Va.

Plumley, Harry, Manag. Editor, Acetylene Journal, Chicago, Ill.

Pence, C. D., Sales Dept., Westinghouse E. & M. Co., E. Pittsburgh, Pa.

Lincoln, J. C., President, Lincoln Electric Co., Cleveland, Ohio

Quelde, G. C., Supt., International Oxygen Company, Verona, Pa.

Quinn, E. L., Foreman, Johnes and Laughlin Co., Pittsburgh, Pa.

Roquemore, F. G., Sales Engr., Oxy. Plant. Groen Mfg. Co., Chicago, Ill.

Rush, J. H., Mgr., Rush Mfg. Co., Pittsburgh, Pa.

Risteen, A. D., Dir. of Tech. Research, Travelers Insurance Co., Hartford, Conn.

Reeder, J. R., Master Mech., Follansbee Iron Co., Toronto, Ohio.
Reeder, B. C., Electr. Acet. Welder, Follansbee Iron Co., Toronto, Ohio
Roberts, C. W., Welding Supr., P. R. R., Columbus, Ohio
Stewart, H. A., Foreman, Nat'l Transit P. & M. Co., Oil City, Pa.
Sullivan, Jos. E., Gen'l Foreman, Westinghouse E. & M. Co., Philadelphia, Pa.
Schaffer, E. L., Dist. Sales Dept., Page Steel and Wire Co., Pittsburgh, Pa.
Smith, Andrew, Smith Metal Perforating Co., Pittsburgh, Pa.
Slack, W. A., President, Torchweld Equipment Co., Chicago, Ill
Semmer, M. R., Service Dept., Air Reduction Co., Pittsburgh, Pa.
Spraragen, Wm., Secretary, Division of Engr., Nat'l Research Council, New York
Schrubb, V. F., Carbo-Hydrogen Co., Pittsburgh, Pa.
Sanderson, P. R., Engineer, Smith Metal Perforating Co., Pittsburgh, Pa.
Smith, H. S., Engineer, Prest-O-Lite Company, New York
Tobey, H. W., Elect. Engr., General Electric Company, Pittsfield, Mass.
Warner, W. L., General Electric Company, Schenectady, New York
Wray, Edward, Publisher, Ry. Purchaser & Stores, Chicago, Ill.
Warfel, J. A., Manager, Air Reduction Sales Co., Pittsburgh, Pa.
Walsh, Henry I., Newport News, S. B. and D. D. Co., Hilton Village, Va.
Wagner, R. E., Asst. Supt., General Electric Co., Pittsfield, Mass.
Wallace, W. S., Mgr., Pittsburgh Office, Burke Electric Co., Pittsburgh, Pa.
Watson, L. B., Shop Demonstrator, Erie R. R., Meadville, Pa.
Waring, F. M., Engineer of Tests, Pennsylvania System, Altoona, Pa.
Wry, Thomas A., Engineer, General Electric Company, Lynn, Mass.

## EMPLOYMENT SERVICE BULLETIN

Opportunities.—The Society is glad to learn of desirable opportunities from responsible sources, announcements of which will be published without charge in the Bulletin.

Services Available.—Under this heading brief announcements (not more than seventy-five words in length) will be published without charge to members. Announcements will not be repeated except upon request received after an interval of three months; during this period, names and records will remain in the office reference files.

Note.—Copy for publication in the BULLETIN should reach the Society's Office not later than the thirtieth of the month if publication in the following issue is desired. *ALL REPLIES should be Addressed to the Number Indicated in Each Case and Mailed to Society Headquarters.*

### POSITION VACANT

V-14. Have opening in the Welding Division, Practice Department, requiring the services of a thoroughly experienced welder capable of supervising oxy-acetylene, electric and thermit welding in all its branches. Applicant must be highly efficient on inspecting jobs and be able to estimate time, material and method required to complete same.

V-15. Salesman. Need first-class salesman for New York territory to sell oxy-acetylene welding and cutting equipment. Must be an order getter.

### POSITION AVAILABLE

A-20. First-class welder desires position. An expert welder who can supervise, demonstrate, also act as consulting welding engineer. Have eight years experience on ship repair and ship cnostruction, in locomotive plants and engineering work of all kinds in welding field. Can furnish excellent references. Willing to travel anywhere and accept position either as welder or superintendent.

# WELDING AND INSURANCE *

A. D. DISTEEN, PH. D. †

In addressing you on this subject I do not pretend to be an official spokesman for insurance companies in general. I am glad that I do not occupy that position, in fact, because the views that such companies hold are so varied that it would be hardly possible to compress them into one short paper, without entangling my intellectual apparatus beyond repair. Some companies still feel that welding is innately and essentially so uncertain that it cannot be accepted under any circumstances, for jobs where considerable strength is required and where serious consequences might follow in the event of failure. Others, like the one with which I am associated, and for which alone I am authorized to speak, feel that welding has pretty well passed through its experimental stage, and that with certain limitations and restrictions it can properly be included in insurance coverage, except in certain applications where we are not yet ready to accept it without question.

There was a time, not many years ago, when fusion welding was admittedly uncertain, and when dependence could not be placed upon it; but owing to the study and research that have since been devoted to it, we are now faced with this condition,—namely, that an immense number of welds have been made, both by gas and by electricity, and if we fix our attention solely upon the ones that have been made by skilled and trained operators, provided with apparatus and materials that have been approved by those who have studied the art with the greatest care, the number of failures that have occurred in recent times is fairly small, and in itself proves that fusion welding, when done under proper conditions, has definitely entered into the class of insurable things.

Right here I must say a word or two about the theory of insurance, because otherwise we may not understand each other. Many persons consider insurance to be nothing but a legalized form of betting, in which the insurance company lays odds against the occurrence of some specified event. To a certain extent this is true, the fundamental idea of insurance being to pay a considerable sum to the policyholder in the event of a specified misfortune, the person or concern taking out the insurance paying a small sum, periodically, to furnish the funds from which the losses can be met. But please observe that insurance is not in any sense a *sporting* activity, and that it cannot be legitimately undertaken except where the odds against the occurrence of the specified misfortune are rather heavy. No conservative insurance company would consider insuring against an event where the chance of its occurrence is as great, for example as one in three or four.

---

† Director of Technical Research, The Travelers Insurance Company.

* A paper read before the American Welding Society at Pittsburgh, on October 26, 1923.

The primary object of insurance is to protect individuals or corporations, so far as possible, from the immediate consequences of certain definite misfortunes. It aims to distribute these consequences over the community, instead of allowing them to be visited, perhaps with crushing force, upon the persons or concerns that are immediately affected.

Moreover, insurance, in order to be sound and stable, must have a large field in which to operate. It is neither logical nor conservative to issue insurance against forms of risk which exist only here and there, because it is not possible to ascertain in such a case what the loss-ratio would be likely to be, nor what the premium ought to be. For example, when welding was done to only a limited extent there was not experience enough to judge intelligently as to the likelihood of failure and therefore the field was not an attractive one for the insurance company. Now, however, this argument has lost its force, and we are in position to estimate the fair size of a premium, with justice both to the insurance company and to the concern that pays the premium.

Up to this point I have talked about the attitude of the insurance company toward welding, but now I want to say a few words about the relation of the welder to his *own* art. I do not need to tell you that there are welders and welders. Some of them are able to turn out repair jobs that appear to be almost better than new, and which when judged by the practical test of experience stand up wonderfully well under the most trying conditions. But there are others who really ought not to be allowed to weld anything more hazardous than a kitchen teakettle. And of course it is plain that this unfortunate state of things must be recognized and dealt with, somehow or other, by the insurance company. We cannot be expected to close our eyes to it, and to insure welds indiscriminately, no matter who makes them, nor what kind of an outfit he has.

While driving my automobile through a city in the Middle West a short time ago, I had the misfortune to break the cast-iron bracket of the starter. I removed the thing and took it to a gas welder of whom I had heard excellent reports. He pre-heated the bracket thoroughly, and in due time applied the filling and completed the weld. It was then necessary to cool the bracket slowly and carefully, and he did this by keeping hot flames playing upon it, while the whole thing was covered over by a hood of asbestos paper. Every once in a while he would turn down the flames *just a trifle*. I saw that he was trying to do a first-class job, and that was what I wanted; but when the cooling had gone on for two hours I suggested that he hasten it a bit, because I wanted to get on my way. I earnestly commend his reply to the attention of every man who welds whether it be by gas or electricity. "I'm going to cool this job right," he said, "and you'll have to wait another hour. Please don't be impatient, because *you* haven't anything to risk but a starter bracket, while *I* have my reputation at stake." After he had said that, I would have waited all night with the utmost cheerfulness; and the spirit that he showed is the spirit that ought to be cultivated

by all welders who respect their art, and who want to see their businesses grow and prosper. If I had another job of welding to do while in that vicinity, or if I had a chance to send a job to somebody near that place, I should certainly favor that man in every practicable way.

We need in the welding business more of the spirit that this man showed. Of course he does not stand alone in feeling as he does, but it is equally true that there are many welders who have not yet been converted to this point of view. A little while ago I attended a meeting where welding was being discussed, and one speaker told us how easy it is to make good welders. He had formed a class that did not contain a single man with previous mechanical training,—quite a fraction of them being, as he told us, either barbers or ex-bartenders. He gave these men a short, intensive course of training in the use of the gas torch and in the preparation of specimens for welding. I think it lasted only about two weeks, and at the end of that time he gave the class some test-pieces to weld, and then examined the resulting work by means of a testing machine. Every specimen showed just as much strength as would have been expected from the work of a man who had been engaged in welding for many years. From this the inference was drawn that welding is really a simple art, and that after a few lessons and a small amount of practice, barbers and barkeepers can acquire skill enough at it to be intrusted with the making of welds in general. Now, I don't question the sincerity of this gentleman, yet I disagree with his conclusion absolutely. There is altogether too much of that sort of thing done, and much of the opposition to welding has been due to it. No doubt, it is quite possible to teach men who have had no previous mechanical experience to get a satisfactory union between two test-pieces, after a short training. But the joining of a couple of test-pieces is one thing, and the making of a weld in a machine or other apparatus that must stand up under subsequent usage is a totally different thing. It is highly important that a welder who is to work on jobs where failure would be followed by serious consequences, should be a good mechanic to begin with, and that he should have a sound working knowledge of the properties of metals, and a sufficient knowledge of the way in which stresses and strains are likely to be distributed in the things he welds.

I recall a case in which a fire-crack developed at the girth joint of a horizontal tubular boiler, directly over the fire. These cracks, as you know, run from the edge of the sheet into the rivet holes. They are rather common, and it may be that they are not particularly serious. Judgment on this score must be given in each individual case, after an inspection of the crack itself. Sometimes they extend *beyond* the rivet holes into the main sheet, and in a case of this kind they must be carefully watched, and it is usually advisable to take reasonably prompt action in the way of making repairs. At all events, in the case that I have in mind it was thought best to weld up one of these cracks, and the job was let out to a welder who had never done work of this kind, but who had made other welds with

success and felt no doubt about his own competence. He cut out the rivet to which the crack ran, trimmed out the crack itself as much as he thought necessary, and then did the welding. Everything looked all right, but when the sheet had cooled down it was found that two new and similar cracks had developed, running to the adjacent rivets on the two sides of the crack that had been welded. The welder, feeling responsible for these new cracks, treated them in the same way, and when the sheet had cooled a second time he found two more new cracks, running to the rivets immediately beyond the cracks that he had just filled up. This disturbed him a bit, because he had visions of spending the rest of his natural life chasing the fire-cracks around the boiler, and so, being a conscientious man, he called in another welder who had had experience with work of this particular kind, and got him to finish the job. The new man explained that in welding a fire-crack it is important to take out several rivets on each side of the defect, so that the sheet may have a chance to expand freely when it is heated, and so that it can come back into place again, upon cooling, without being subjected to severe contraction stresses. He fixed up the last-formed cracks in this way, and then, when the metal was cool, he drove in some new rivets and the job was a success. What do you suppose our friends the barbers and barkeepers, who could weld a couple of test-pieces together satisfactorily, would have made out of a simple task like this one?

Just one more illustration along the same line. In a city not far from here, a serious crack developed in the large cast-iron standard of a certain machine, and two welders were invited to bid for the work of making the repairs. One of the bids was fully twice the other and the owners of the machine knowing nothing about welding, could not understand why there should be so much difference. They went to the man (let us call him "A") who made the higher bid, and told him that they would like to give him the work, but felt that they would not be justified in doing so at the price he had named, because the other man, "B," had offered to do it at half that figure. They told "A," however, that they would give him the job if he would do it at the price named by "B." He refused to entertain this proposal, stating that he could hardly make the work *ready* to weld without putting himself to that amount of expense, and this would mean that he would have to do the subsequent welding at his own cost. Under those circumstances the job was given to "'B" at the lower price, and "B" undertook it, with a result that he believed to be satisfactory. It turned out, however, that there was no true adhesion between his filling material and the cast iron of the standard, and the filling material soon came loose, so that it could be lifted out entire. I saw it after it had been removed, and it was perfectly evident that there had been no adhesion except in a few small spots,—just enough to hold the piece in place temporarily. The owners of the machine then went to the other man, "A," and told him that if he could guarantee a proper result he could have the work at his own original price. He took it, gave proper attention to pre-heating and slow subsequent cooling, and got good ad-

hesion at all points. The owners of the machine tested the completed job, most unwisely, by banging it with a heavy sledge, at the risk of fracturing the standard in a brand-new place. The weld stood up, however, and it is still standing up to-day, and probably will never give any trouble whatsoever. This example teaches several things. In the first place, it demonstrates the unwisdom of letting out a welding job to the lowest bidder, without due regard to the experience and skill and technical knowledge of the man who is to do the work. Secondly, it shows that "A" was justified in refusing to take the job at a figure which would either have subjected him to personal loss or forced him to do it in an improper way.

Now, when the insurance company does not show extravagant enthusiasm over covering welded repair-jobs, you who understand the ins and outs of welding thoroughly, and who know just what must be done in each case, and are willing to do it conscientiously, must not take that attitude unkindly. You should realize that we have to consider work which is done by men who are not properly prepared to do what they undertake, and some of them in their anxiety to get a paritcular job may perhaps bid so low that they cannot do it in what they know is the right way and come out with a reasonable profit.

I have no thought of criticizing welders as a class. I am merely trying to make it plain that the insurance companies' opposition to welding, so far as there still is such opposition, depends largely upon the fact that there are men who either do not know how to do a job right, or are unwilling to give the time and attention to it that they know it ought to have. A good job is like the biblical bread cast upon the waters,—except that we are merely promised that the bread will return unto us "after many days," whereas in the case of the welding job the results are likely to appear without such prolonged waiting.

I have emphasized the difference between welding up a pair of flat test-pieces, and doing a job on some machine or other structure; and in this direction I want to say a few words more. When the test-pieces have been welded together and are pulled apart in a testing-machine, the pull (except in certain special cases) is a straight one, parallel to the plates that are joined, In actual practice the case is often quite different, and one of the things that we have to look out for is the keeping of the weld out of any region where it might be subjected to *bending* action. There is often some small bending stress in parts that we do not think of as being subject to such stress, and this should be carefully considered when planning out a job of welding. Then again, there are often severe bending stresses in places where we may know there is *some* stress of this character, but where we fail to appreciate how great the actual stress really is; and there are also places where the ordinary tensile pull is concentrated far more than is likely to be realized. As an example of these points I should like to call your attention to certain experiments that were made some years ago by S. H. Barraclough and

A. J. Gibson, in Australia, and published by the Engineering Association of New South Wales. It is unfortunate for us that the paper was published in such a remote place, but it is available in our larger libraries, and in libraries that have specialized along technical lines. An abstract of it was also published in the issue of *"Power"* for April 15, 1913, though to understand the real importance of the research it is advisable to read the entire paper in the original form. An investigation was made of the stresses that occur in the turn of the head-flange of a boiler or other vessel that is subjected to internal pressure, and also of those that occur in boiler sheets, near lap joints. Of course we all know that the stresses in these regions are severe and by no means simple, yet it is something of a revelation to see how great these stresses may become, especially in the flange of a head when the radius of the turn of the flange is small. I am sure that no welder who had seen this paper would ever undertake to make a weld in the turn of a flange of short radius, nor to use a weld to take the place of such a turn on any vessel that is to carry a considerable pressure. These experiments are in harmony with the results of the interesting and important tests of welded joints that were recently made at the United States Bureau of Standards, so far as the two are comparable.

I should also like to call attention to an important investigation that was undertaken some years ago under the direction of Karl Pearson in England, and which was afterward continued in our own country by Walter Rautenstrauch, for although these researches related specially to *hooks*, yet the principles that they brought out are applicable to structures of many other kinds.

Discontinuities of any kind in a piece of material are likely to involve serious local concentrations of stress. Therefore, welds should be kept away from points where such discontinuities occur or else if they must be used in such places they should be made with due recognition of the conditions that must be met. For example, in the case of a sheet of metal which is subjected to a lengthwise tension that is uniform throughout the plate in general, the pressure of a hole through the plate disturbs the distribution of stress in such a way that after the hole has been made the stress close to the sides of it is likely to be *twice* as great as that prevailing in other parts of the plate, which are remote from the hole. I do not here refer to stresses that are introduced by the act of *making* the hole, but to those that are present in consequence of its mere *existence*. It is preferable, therefore, to avoid running a weld across a hole that must be left open. It is apparently better to weld in a new piece of plate, and make the needed hole in the sound piece that is thus inserted. Of course, it has long been recognized that there is great concentration of stress at a place where any structure carrying a considerable load suddenly changes in size or direction, and machinists and other metal workers are careful to provide fillets of suitable radius where such changes must occur, because this makes the transition less abrupt, and tends to prevent the stresses from being localized too intensely.

In commenting upon the failure of a welded piece, welders often tell us that "it did not fail at the weld, but in the original metal near the weld." Breaks of this kind are sometimes considered to be good evidence of the strength of the welds, and sometimes as evidence that the welding operation changed the character of the sound metal near by, so that it could not stand the stress that it was capable of sustaining before the weld was made. I doubt very much if either one of these extremes tells the whole truth *on all occasions*. It is quite possible that the intense heating to which the metal is subjected near the weld may modify its character, and the modification may be in an undesirable direction,—especially if the work is done by a man who has insufficient knowledge of heat treatment and metallurgy in general. On the other hand, we must remember that there was some reason *why* the original metal failed at the particular place where failure did actually occur. The very fact that failure occured in this place shows either that the metal was weakest at this point, or else that there was some kind of a concentration of stress there, momentary or permanent. Whichever one of these facts was responsible for the original fracture, we have to consider, if we want to be fair, the possibility that the same cause was still active after the piece was welded. A brake rod on my automobile that had done good service for about two years broke square off one day, and not being able to get a new rod (which I knew was the proper procedure because the old one had doubtless been weakened in consequence of the continued vibration to which the motion of the car had subjected it) I had it welded together and put back in place, in the expectation that it would last for a little while at all events. This expectation was fulfilled in the most literal way, because the same rod broke again on the very next day, within an inch of the first break. Fortunately I was then near a place where new brake rods for my type of car could be had, and I did not try the welding a second time. Of course, this was a trivial occurrence, but I mention it because there were no complications involved, and it was a plain case of the rod failing near the weld, not because the weld had weakened the metal, but because the strength of the metal through a considerable part of the rod had deteriorated before the weld was made, and apparently pretty uniformly over some inches of length, at least. I think I am right in saying that this particular experience is quite familiar to experienced automobile repair men, and in my judgment it does not reflect in any way upon the workmanship with which the welds are made. It does suggest, however (and this is the point that I want to make), that there are times and places where welding is not advisable, for the simple reason that it may be like putting a patch of new cloth upon an old garment.

The reference to the brake rod brings up another point that is of considerable interest and which has not yet received sufficient attention,—mainly because the art of welding is still so young. I refer to the durability of welds when they are exposed to repeated stresses, whether these stresses are continually reversed or merely applied intermittently. The general subjct of fatigue of materials

is exceedingly broad, and although a great deal of work has been done in this direction upon sound pieces of metal, yet even in that field there is still much to be desired. So far as I know, very little has been done in the way of studying the fatigue of welded joints, and therefore as a conservative insurance man I should counsel avoiding welds so far as possible, wherever the fatigue element might come in. By and by, when we know more about the ability of welds to resist fatigue, we may see that this caution is not necessary; but until that time comes I feel that it can hardly be expected that insurance companies will look with enthusiasm upon the welding of parts that have to resist heavy stresses of an intermittent or reversing character.

Something like two years ago I made an address on this same subject before the International Acetylene Association, and notwithstanding the wonderful advance that the art of welding has made since that time, I feel that a few fundamental points that were made in that earlier address should be repeated on the present occasion, in order to avoid misunderstanding as to the position of the insurance company in certain important respects. I said, for example, that we consider it to be exceedingly important to have welds made by specially skilled men who know just exactly how the job ought to be done, and who are conscientious enough to do it in that way. Furthermore, these men should be provided with the right kind of materials and with the right kind of apparatus, and they should be allowed to do the work at a rate that is known to be consistent with the obtaining of good results, and they should have every facility for pre-heating the work when such pre-heating is necessary, and for preparing it for welding, and for cooling it down slowly when slow cooling is important. Now, a welder, unlike a poet, is made and not born. It is probably true that a man must be born with certain tastes and talents, in order for it to be possible to turn him into a good welder; but he cannot be born with the knowledge and skill that he must possess before he can qualify as an expert. It follows that there will be many welders with us, all the time, who are not skilled enough to be intrusted with work of high importance, but who are nevertheless capable of being *trained* so as to make the highly skilled men to whom I refer. A man of this type should be treated as we treat one who aspires to be a surgeon. If he is to do repair work, he is in fact a sort of surgeon, who works upon metal instead of upon flesh and bone. He should receive a thorough course of instruction from those who know what good welding is and how it should be done, and he should be tried out on relatively unimportant jobs first, and be allowed to progress toward the performing of more and more important work,—serving, when he takes up each new line, as an assistant to a more qualified man whom he can watch and from whom he can learn how things should be done. In this country we are too quick to turn a man loose at the doing of special work. We need more men who love their work,—old-fashioned men who take pride in doing a thing right, and to whom a poor job is an abomination, not to be tolerated for a mo-

ment. In welding work we need this spirit more, perhaps, than anywhere else; and whenever we see evidence of it, we should go out of our way to make it clear that that sort of thing is appreciated and wanted, and that advancement will surely come to every man who shows it.

You may be disposed to take exception to some of the suggestions made in this paper, on the score that they are impractical. How can we expect, for example, to train welders so that they will not only be able to make good welds, but will also understand all these things that I have said should be understood? Well, perhaps that is asking too much. A man with all that information in his head might be in position to command more money than we could afford to pay a welder; and of course it is in the order of things that the man who does a job need not necessarily know all the theoretical points associated with it. He may be a wizard with a torch, for example, and be exceedingly valuable for that reason; and yet he may not know much about the theory of stresses and strains. I do not insist, however, that the man who actually makes the weld must personally know all these things; yet *somebody* who has authority in connection with the doing of each important job should know the things that it is essential to know, in order to insure that the job shall be a success. Somebody should *diagnose* the case and prescribe the exact treatment that should be given, and then the man who is skilled in the practical work can proceed with it.

Now the small concern can hardly afford to have a specially trained welding engineer, who will know all about special difficulties and how to overcome them, but the large concern *can* have such a man, and this brings us to another point, which I believe to be exceedingly important. Namely, welding jobs the failure of which would jeopardize lives and large property interests should be done by large concerns, which have a great deal at stake in the event of failure. You will please understand that I have no prejudice whatsoever against the small concern. I hope it may grow and prosper, and I am sure it will, if it does its work in the right way. All the big ones were little ones at the start. But it is in the nature of things that a large concern can afford to do things that a small one cannot, and I do not see why we should not recognize this fact without apology. Perhaps the time will soon come when the small welders who have important and difficult repair jobs offered to them can have a sort of community consulting engineer who will serve them all, collectively, for a reasonable consultation fee. In that event the small welder might more appropriately undertake work where a great deal is at stake, though there would still be the difficulty that the small concern has less at risk than the large one,—less prospective business to lose in the event of a disastrous accident that might conceivably be attributed by a court, or some other authority, to improper workmanship; and this means that the large concern has a far larger material incentive to take every possible care to have things done in the right way.

Why is it not logical for the concerns who furnish the energy

that is needed for making welds to undertake the training of welders? This principle is already recognized, I believe, in the gas-welding industry, but it does not appear to appeal to the great public-service corporations that furnish the energy that is used in electric welding. I suggest, therefore, that manufacturers of apparatus that is used for electric welding try to interest central power stations in this thing. There may be some reason why such a course would not be practicable, but I do not see it.

Just one thing more. I said in my previous address, and I want to repeat it on this occasion also, that one of the greatest difficulties that the insurance company has, is to judge a weld after it is completed and when they know nothing about the skill of the man who made it. I think it is fair to say that a really skilled and entirely competent welder knows, when he is making the weld, whether it is going to be a good weld or not. He knows what ought to be done in the way of preparation, he knows whether he has done this properly or not, he knows whether he has used the right filling material or not, he knows whether he has or has not pre-heated and slowly cooled his work in the proper way, and when he is running the metal into place he knows, or he ought to know, from the way in which it behaves, whether he is getting a good joint or not. You will see, however, that the insurance company's inspector, not having had the opportunity of watching the making of the weld, and usually being incapable of qualifying as an expert welder himself (although he may know considerable about how the job ought to be done) is in a totally different position. Here is the weld, and the question is, whether he shall approve it or not. Now, if you gentlemen have something to suggest as to how this inspector is going to answer that question intelligently, then I sincerely wish that you would give me the answer to this problem, because it is a serious one and we sorely need to know what is the right thing to do about it. We want to be entirely reasonable, but we do not want to pass welds that should not be passed, for the duty that they have to stand. It is not simply that we would have to lose some money if the weld failed. That, of course, is a consideration that has its proper weight; but in addition we feel that we have a certain moral obligation toward the public to know something definite about the dependability of the things that we insure, whether they are welds or not.

It has been well recognized that a practicable test is needed by which the dependability of a weld can be judged, even though we may know nothing about the skill of the welder or the conditions under which the work was done, and a great deal of thought and experimental work have been expended upon this problem. It is perfectly plain, I am sure, that the discovery of a good test of this kind would be of immense value, and that it would go a long way toward disposing of the objections that insurance companies have raised to the covering of welded joints in important places. The cutting of a small coupon out of the completed weld has it's limitations. So far as I know, the hammer test is the best one that has

yet been developed, yet I still feel, as I said in the previous address to which I have already referred, that "it is not a sufficiently positive method to justify the acceptance of welds in places where insurance companies do not now consider them to be permissible." Pending the probable discovery of something that is much more positive yet wholly practical, I feel that the insurance company must continue to take the position that its judgment of a weld must depend upon its knowledge of the circumstances under which the weld was made,—namely, upon its knowledge of the welder, the equipment, and the material,—these are the things we have to know about before we can reasonably be expected to be enthusiastic about a weld upon the soundness and strength of which we must depend for the security of life and property. If this is not a fair statement of the situation, then I shall listen with the greatest interest to any alternative suggestions that the gentlemen present may care to make.

This may sound like a sort of challenge, opening up the subject all over again, and refusing recognition to the progress that has been made; but it is not so intended. We know quite well how hard you gentlemen are trying to find this test for which we ask. We know that you want it, just as much as we do. We know that well-made welds are to-day vastly more dependable than they were only two or three years ago. We want to cooperate with you, and to be friendly and helpful, and not supercritical; and if you do not interpret this present address in that way, I shall be sorely disappointed.

Order Your

1923 BOUND VOLUME OF JOURNAL NOW!

Only a few will be made up this year.

$5.00 per copy.

# HUGE COAL DRYER OXY-ACETYLENE WELDED

T. C. FETHERSTON

The great coal dryers used in a number of industries are typical of a class of kilns and retorts used in the manufacture of cement and many other bulky products. These dryers are subjected to wide variations in temperature and often carry very heavy loads. While in operation they revolve to agitate their contents and this, in addition to the forces set up by temperature changes, subjects the material from which the dryer is made to terrific stresses.

Thus it is necessary that equipment of this type be of sturdy construction, and that, where it is necessary to join the heavy plate from which the dryers are made, the strength of the joint be as nearly as possible equivalent to that of the original sheet. The fact that these dryers are rotated while in service calls for exact alignment since even a slight eccentricity would be likely to impose a severe strain upon either the dryer itself or upon its supports and attachments. These dryers are usually fitted with fins or baffle

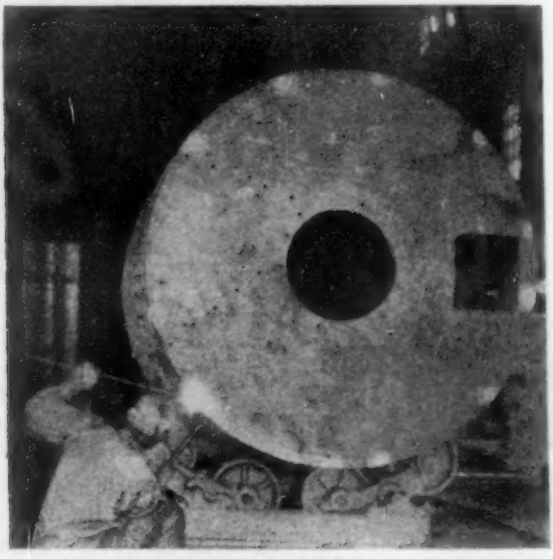


Fig. 1—Welding the Head—Note Rollers

plates on the inside to insure the even drying of the material handled, and these must also line up exactly if the best results are to be obtained.

Recently, at a plant in southeastern Pennsylvania when the construction of a coal dryer of this type was undertaken it was decided to join the steel plates which compose the outer shell and the internal flue by oxy-acetylene welding, and to attach the circular head, permanently fitted in one end, by the same means. The dryer in this

case was 35 ft. long and 5ft. 10 in. in diameter and the flue, so fitted inside this outer shell that its circumference was concentric with the latter, was 28 ft. 9 in. in length and 2 ft. 6 in. in diameter.

The material used in this instances was ⅜ in. steel tank plates. Formed plates were laid out on the floor, which was equipped with rollers to facilitate turning the sections as the welding of the circumferential seams progressed. The outer shell was composed of four sections 8 ft. 9 in. in length, and the longitudinal seam in each one of these sections was first welded. The plates had been prepared for welding with edges beveled at 45°, this giving a total 90° vee. Before welding, the edges of the plate were separated about 3/32 of an inch at the beginning of the weld and about 2½ in. at the point where the weld was to be completed, this spacing being equivalent to about 2.5% of the length of the seam in inches, or

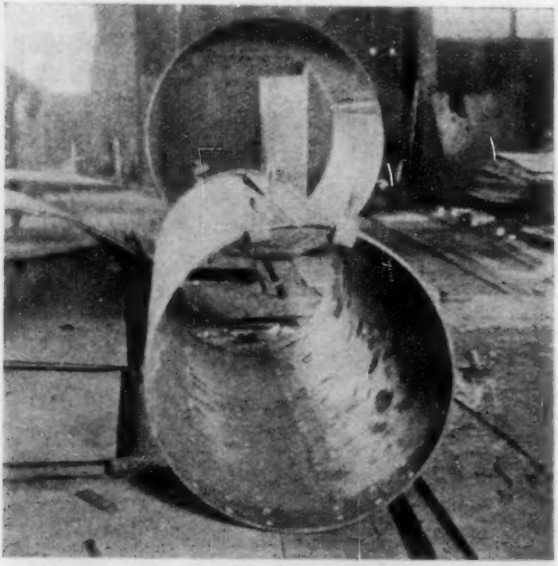


Fig. 2—Inner Shell Set Up for Welding

allowance for expansion of about ¼ in. to the foot. This allowance proved to be correct for the thickness of the plate used as the edges came together properly at the end of each seam, when welding was completed.

A nickel steel welding rod was used, since a rod of this kind will produce a weld of higher tensile strength than can ordinarily be obtained with drawn iron rod. This type of rod is particularly adapted to use in welding vessels where exceptional strength is required, or where the weld is to be subjected to frequent or sudden changes in temperature.

When the four cylindrical sections for the outer shell were completed by welding the logitudinal seam, the joining of these sections began. The two sections to be joined were aligned by the use

of six 10 ft. lengths of angle iron which were attached to the inside of the shell equal distances apart with bolts, the holes for which were already in the shell of the dryer. The bolt holes in the shell were 11/16 in. in diameter and those in the angle iron braces were ¾ in. A ½ in. bolt was used and this allowed about ⅛ in. play for expansion of the sheets during the welding.

Wedges were inserted between each pair of angle iron braces to separate the two sections of the shell as lined up for welding. Tack welds were then made between the wedges and the angle irons. To

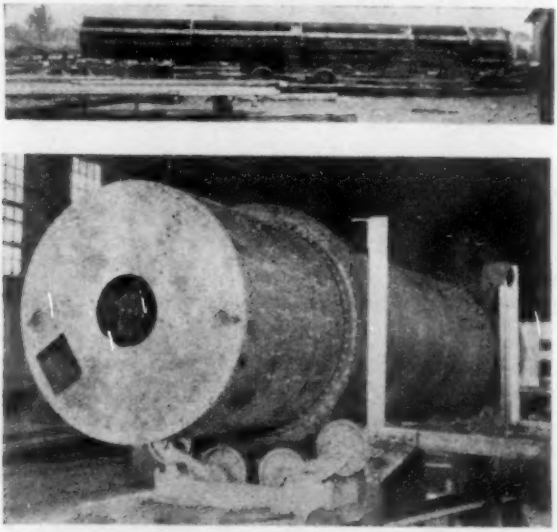


Fig. 3—Top—The Completed Dryer
Bottom—Section of Outer Shell

equalize heating and expansion these tack welds were made one at a time, each weld being located as nearly as possible at a point 180° from the previous one made.

When the two sections of the outer shell were thus tack welded together the welding of the entire circumferential seam was carried through to completion. The edges of the plate at this point had been prepared with a double vee bevel and one operator worked on the inside of the shell while another welded from the outside. Two of the girth seams in the outer shell sections were welded in this way. The space between the third and fourth sections, however, was utilized to attach the gear for revolving the dryer when in use and here the plates were attached to the revolving gear by riveting.

The inner flue was built of three sections 8 ft. 3 in. long and one 4 ft. long. The four logitudinal seams and the three girth seams in this case were welded in substantially the same manner as the welding of the outer shell was handled, with the exception that the edges of the plate were beveled to a single vee only for both the logitudinal and circumferential seams.

The fins and baffle plates were attached to the inside of the outer shell and to the outside of the flue, the flue was stayed in place, and the end plate welded in. The end plate was first tack welded into place and then the entire seam completed by welding from the outside only.

The baffle plates in these dryers require frequent replacement, and to simplify taking the worn plates out and putting new ones in place these are riveted to the shell. The rivet holes for the baffle

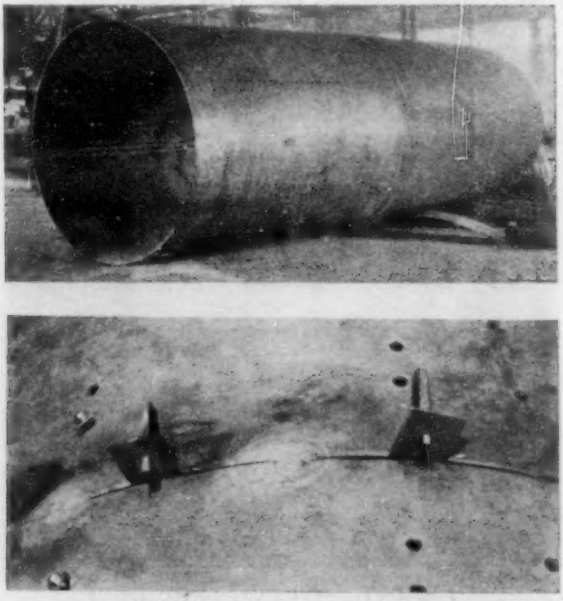


Fig. 4—Top—Welded Outer Shell
Bottom—Tack Welds and Wedges

plates had been punched in the sheet before welding, and likewise the holes in the baffle plates were laid out from drawings before assembling. However, when these attachments were applied to the welded outer shell and flue it was found that the bolt holes aligned exactly and that it was not necessary to ream out or alter the location of a single rivet hole. Before the plant which handled this work shipped the completed dryer to its customer the dryer was set up as it would be erected in service, power was applied and it was rotated just as if it were in actual use. While this was going on plumb lines were dropped at various points along the structure and it was found from this test that at no point was the completed dryer more than ⅛ in. out of true, which is less than the limits specified for riveted work.

# ARC WELDING OF FUEL OIL TANKS*

PLINY P. PIPES†

As improvements are continually being made in the arc welding process as well as in equipment, a greater field is being opened for the application of this process. Yet the impression still prevails among many engineers even to-day that tight joints cannot be secured with arc welding on tank work. This condition is undoubtedly the result of failures occurring in tanks that were welded by unskilled and inexperienced operators. With proper materials, the average experienced operator should have no difficulty in making absolutely tight welds on low pressure work, and even on high pressure work with proper design and procedure the skilled operator can make uniformly non-leakable welds.

The recent construction entirely by the electric arc welding process of four large fuel oil tanks in the Equitable Building, New York City, should be of interest to all those concerned with the welding industry. The complete oil burning installation was made by the Petroleum Heat & Power Company, a contract being sublet to the James Russell Boiler Works Company of Boston for the construction of four tanks by arc welding. The welding was done with direct current, using mild steel electrodes.

All four tanks were rectangular in cross-section with the exception of irregular corners to allow for building columns and walls, and varied in length from 17 feet to 19 feet, in width from 11 feet to 17 ft. 7 in. and were 21 ft. 3 in. high. This being the maximum height at which the suction of oil will work satisfactorily.

The tanks were made of standard steel plates $\frac{3}{8}$ in. thick and assembled by regular lap joints and flange corners with bolts at approximately 30 in. centers. All joints were welded from both inside and outside. The assembly bolts were also welded in place from both inside and outside. Bracing rods, $1\frac{3}{8}$ in. diameter on 24 in. centers were used between all parallel surfaces making three complete sets of rods which were perpendicular to either of the other two sets. These rods extended through the sheets and have a washer and standard hexagonal 6 in. x $\frac{3}{8}$ in. nut welded on each end. With bracing rods on 24 in. centers the load was so distributed that the maximum deflection of the plate was $\frac{1}{2}$ in. midway between rods.

The four tanks were tested individually at a specified hyrostatic pressure of 25 lbs. to the square inch and proved absolutely tight with no sign of undue stress or failure in any weld. The tanks were passed, on the first inspection, by the New York City Fire Department Inspectors.

Since all work had to be done on the job, all material was taken down the side walk elevator in small pieces and passed through the fire room into the coal bunkers where the work was completed.

---

*To be presented at the Nov. 1923 meeting of the New York Section.

†Welding Engineer, Lincoln Electric Co.

After the tanks were assembled there was only about 12 inches space on all sides between the walls and tank, which made it necessary to move the tank from side to side in order to do the welding work properly.

Realizing that the largest tank weighed in the neighborhood of 35 tons and the smallest tank about 19 tons, it is evident that the construction of these tanks by welding was no little achievement. However, with a job of this kind in mind the Engineer should have no doubt regarding the feasibility of constructing large tanks for oil storage purposes by the electric arc welding process since the work is done quicker and cheaper, and better tanks are obtained by welding than by the riveting method.

---

## RECLAMATION ON SOUTHERN PACIFIC *

E. J. BECKER †

Reclamation of material is the recovery of money otherwise lost. It means the recovery or salvaging of material unsuitable or unsafe in its existing condition for further use, which, by wisely directed expenditure, can be renewed to further serve its original purpose or made fit for other usage.

Stimulation of greater interest in this work on our railroads is to be desired as the opportunities for further accomplishment in reclamation are limitless. Continued educational efforts in all branches of the service are necessary to properly acquaint everyone with the startling economic possibilities which lie in this direction. The limit is reached only when material disposed of as scrap is scrap in the exact sense of the word. To augment interest in this subject, the Southern Pacific Company takes pleasure in briefly presenting a few of its reclamation practices.

The "balance sheet" for 1922 reads as follows:

SAVINGS BY RECLAMATION

| | | |
|---|---|---|
| Value of reclaimed material if purchased new | | $1,102,091.12 |
| Scrap value | $136,777.28 | |
| Reclamation cost | 229,804.79 | |
| Total cost | | 366,582.07 |
| Savings effected | | 735,509.05 |

*Reclamation of Loco Strainer Boxes*

Strainer boxes used between locomotive and tender, which have been discarded on account of worn or battered thread are again made serviceable by removing old threads by machine, building up

* Presented at the Sept. 1923 meeting of the San Francisco Section, A. W. S
† General Inspector of Stores, Southern Pacific Co.

by oxy-acetylene process and threading. We now have a strainer box as good as new for 35% of the article's original cost.

*Broken Monkey Wrenches*

Wrenches are made serviceable by building up with brass—oxy-weld process—effecting a saving of 50% on broken parts which otherwise would be scrap. Tools of a similar nature are also repaired in this manner.

*Reclamation of Couplers*

Couplers condemned on account of worn shanks are again returned to service by removing the worn part of shank by use of cutting torch, and welding in place a piece of scrap boiler plate of proper size at an average saving of 22% of the cost of new. When repaired, each coupler is stamped with initial of mechanic doing the work, also date and shop. In two years we have repaired a total of 6,277 couplers and only three returned or reported as failures.

*Building Up of Worn Chafing Irons*

Another item in which considerable savings have been effected is the building up of chafing irons by means of oxy-acetylene process. In the old days when a chafing iron became worn beyond a certain point it found its way into the scrap. This also applies to carrier columns and many similar items.

*Continuous Joints or Angle Bars*

Badly battered or cracked joints are made serviceable by means of oxy-acetylene process, and their use for spur or secondary tracks has proven highly satisfactory.

*Building Up of Switch Points or Point Rails*

Oxy-Acetylene building up process has been responsible for this railroad reclaiming 3,000 switch points during the past two years, at an average cost of 40% of the new value, and so far have had no failures. Switch points broken up to 10 in. are being built up. These are not being used in main line tracks as yet; so far have been confined to secondary and spur tracks.

*Repairing Track Frogs*

Track frogs are being built up by the same process used for the same purpose and with the same success.

*Crossing Frog Built Up in Track*

Crossing frogs built up by the oxy-acetylene process in high speed track, have on close inspection, after 8 months service, shown very little signs of wear. Three hundred and ninety-six trains pass over some of them every 24 hours.

*Repairing Chipped Rail in Main Line Track*

The battered or chipped ends of rails are built up by traveling frog gangs in the tracks without removing or disconnecting. There

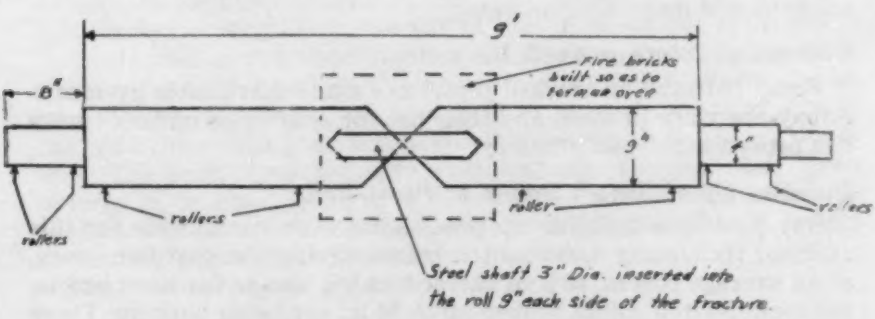
are a number of these rails which were built up over three years ago, and they show little or no sign of wear. The majority of these welds are three or four inches each side of joint, making six to eight inches of welding; the work costs an average of $2.00 per joint (two rail ends). Fifty thousand rails have been so repaired to date.

---

## Repairing a Large Plate Roll for a Gold Mine

J. W. ARNISON

The accompanying sketch illustrates the method used in the repair of this large roll by the metallic arc welding process. The roll was cut out to form a double vee and lined up on eight adjustable vee rollers. An oven of fire bricks was then built around the break and the ends of the roll heated red hot for about 4 in. each side of the fracture. After it was red hot it was covered up with asbestos leaving a hole of sufficient size to enable the welder to see what he was doing but not sufficient to make it uncomfortable for the operator. The electrodes used were cast iron welding rods ⅜ in. diameter




Preparation of Roll Preparatory to Welding

and 24 in. long used for oxy-acetylene welding and were connected to the positive side (reversed polarity) as they were found to work better in this way. Electrodes were covered with a flux consisting of equal parts of carbonate and bicarbonate and 10% precipitated silica.

350 amperes were used and a wide deposit made so as to eliminate blowholes. When the work was finished it was covered with asbestos and allowed to cool slowly. After it was cold it was easily machined to size. The only imperfections were a few blowholes which were filled up with monel metal electrodes.

This roll has been running six months and has been giving good service.

In my opinion the welding of cast iron with a cast iron electrode is much faster than with the studding process as the welding can

proceed as rapidly as the welder can do the work, whereas with the studding process it is necessary to keep the work cool. As a comparison, this particular job took ten hours actual welding for two welders, one relieving the other, whereas a similar job by the studding process took one welder ten days.

---

## Cuurrent Welding Literature

Acetylene Welding Pipes, Prac. Engr. (Aug. 9, 1923), Vol. 68, pp. 83-4, Preparing pipe for welding quantity of welded pipe joints.

Arc Welding, Cyc. Auto. Engr., (Aug. 1923) Vol. 13, pp. 245-9. A new process having possibilities for automobile construction, physical and metallurgical aspect of the cyc arc welds; possibilities of cyc arc welding in automobile works and allied industries.

Autogenous Welding in the Fire Box, Railway and Locomotive Engineering, (September, 1923).

Avoiding Trouble in Use of Oxy-Acetylene Equipment, H. Thompson, Canadian Welding Journal, (Sept. 1923).

British Welding Exhibition, Lorn Campbell, Jr., Welding Engineer, Vol. 8, (Oct. 1923), pp. 23-5. Report of welding exhibition recently held in London.

Cast Iron Welding, Oil Field Engineering (July, 1923), Vol. 25, pp. 148-50

Cast Iron Welding, La Soudure de la Fonte, Ouvrier Moderne, (Aug. 1923), Vol. 6, pp. 186-8.

A Defense of the Welding School, R. K. Randall, Australian Automobile Trade Journal, Vol. 4, (Aug. 1923), pp. 101-14.

Efficiency of Arc Welding, R. D. Reed, Welding Engineer, Vol. 8, p. 28, (Oct. 1923), Choosing a machine for the work, selection of electrodes and choosing the current.

Electric Welding for Safe Ending Boiler Tubes, Railway Electrical Engineer, (October, 1923).

Electric Welding Used Widely in Metal Working Industry. P. P. Pipes, Iron Trade Review, (Aug. 9, 1923), Vol. 73, pp. 379-84. First used to weld lead, heat generated is measured, unsoundness may be avoided, nitrogen has little effect, heat treatment improves metal, foundries use carbon arc, develop automatic machine, how welded joints are tested, metals that can be welded, use special coating.

Jig Welding Operations Require Skill and Attention, J. L. Anderson, Canadian Welding Journal, (Sept. 1923).

Locomotive Frame Welding, A. F. Dillon, Railway Purchases and Stores, (Sept. 1923).

Maintaining Oxy-Acetylene Equipment in Service, Acetylene Journal, (Oct. 1923). Vol. 25, pp. 201-204, 206, Generator houses, disposal of sludge, operation.

Metallography and Testing of Oxy-Acetylene Welds, J. R. Dawson, Welding Engineer, Vol. 8, (Oct. 1923), pp. 19-22 and 42-44. Importance of competent welders, quality of welding rods, low carbon steel welding, test results, medium carbon steel welding, steel forgings, high carbon steel welding, high carbon steel, manganese steel) bend tests of welded manganese steel and cast iron. (Oct. 1923).

Northern Pacific Installation, Acetylene Journal, (Oct. 1923), Vol. 25, pp. 174-76. Oxy-acetylene generating and pipe line system at South Tacoma, Washington.

Oxy-Acetylene Welding of Mild Steels, D. Richardson, Acetylene and Welding Journal, London, (Sept. 1923).

Oxy-Acetylene Welding of Refrigerating Machinery, Acetylene and Welding Journal, London, Sept. 1923.

Production Welding of Sheet Steel by the Oxy-Acetylene Process, J. L.

Anderson, Acetylene Journal, (Oct. 1923), Vol. 25, pp. 169-173, 206. Design, equipment, applications, jigs, hand weldings, mechanical gas welding.

Welding Aluminum Cases, Welding Engineer, Vol. 8, Oct. 1923, pp. 32-4.

Welding and cutting Practice in the Boiler Shop, Marine Boiler Construction and Repair, Boiler Maker, (August 1923), Vol. 23, pp. 217-221. Reclaiming cracked flanges, firms have had long experience with welding, welded steel boilers, Minnesota firm utilizes process, water tank fabrication, materials used, welding widely used in boiler repair work, marine boiler construction and repair work, welded seams.

TRADE CATALOG—Torchweld Equipment Company issues new catalog. The Torchweld Equipment Company has issued a new catalog bound in very attractive form. The catalog includes a description of products, construction of torches, welding units, automatic and hand machines, acetylene generators, manifolds, etc.


## Bulletins of the American Welding Society

BULLETIN No. 1

### Standards for Testing Welds

**These Standard Tests Comprise:**

(a) Shop Standard: A simple standard test for such purposes as checking the work of a welder, testing a new lot of welding wire, and testing the effect of some change in conditions.
(b) Commercial Standard: For cases where more than one kind of test should be made but where the circumstances do not justify a complete investigation.
(c) Research Standard: When a complete investigation of a weld is to be made for research or other purposes, all tests and examinations are made which will contribute any information in regard to the characteristics of the weld.

Price per copy—Members, 25 cents; Non-members, 50 cents.

BULLETIN No. 2

### Welding Wire Specifications and Folios

The specifications and folios are based on the data collected by the Welding Wire Specifications Committee as to the chemical analysis of welding wire used for both gas and electric welding in railroads, shipyards and other places and the service results obtained from the use of such wire. Price per copy—Members, 25 cents; Non-members, 50 cents.

BULLETIN No. 3

### Standards for Electric Arc Welding Apparatus

These rules provide Standards for use in connection with specifications for the purchase, sale and use of Arc Welding Apparatus. The rules include classification, definition of terms, information relative to apparatus to be supplied by the manufacturer and by the prospective purchaser, respectively, and tests. Price per copy—Members, 15 cents; Non-members, 30 cents.

BULLETIN No. 4

### Training Course for Oxy-Acetylene Welders

A report prepared under the joint auspices of the Federal Board of Vocational Education, National Research Council and American Welding Society. For the information of the person who is selecting the candidates the text includes a discussion of the qualifications which the candidate for training should possess. For the information of the instructor the text includes the fundamentals in gas welding, together with a number of type welding jobs arranged in the order of difficulty. These type welding jobs are divided into checking levels with the objective clearly indicated and the auxiliary information which should be given the student for each checking level. Per copy, 25 cents.

BULLETIN No. 5

### Welded Pressure Vessels

This report, which consists of 152 pages, contains the test data obtained as the result of the destructive tests of some 50 welded tanks, together with an analysis of this data and recommendations to the Boiler Code Committee of the A. S. M. E. It includes many illustrations, charts and tables. Price to members, $1.50; to Non-members, $5.00.

## VALUE OF MEMBERSHIP IN THE AMERICAN WELDING SOCIETY

1. The American Welding Society is a national organization representing the highest standards of the welding industry.

2. The work of its various committees is an important and valuable factor in developing, stabilizing and standardizing the entire welding industry.

3. Membership will help increase your knowledge of welding and help you to improve your application of the process.

4. You are offered many opportunities to make personal contact with the leaders of the industry.

5. You will profit by the experiences of the finest trained minds in the welding industry—experience which will save you money.

6. You will receive a monthly publication giving reliable data on the development of the art.

7. By supporting the Society you will help raise the standard of welding efficiency and help to increase the number of efficient welders.

8. Section meetings and publications of the Society offer a medium for the presentation of your knowledge of welding and the discussion of the views of others.

9. Your support will help the Society to counteract adverse legislation and other activities which may not only retard progress of welding but also affect your business.

10. Increased membership will help us carry out new activities, will help us maintain departments, which at the present time our limited finances will not permit, such as Employment Bureau, Library Facilities, Standardization Work, etc.

Welding is the most economic process developed for the industrial world and deserves your full support. Write to the Secretary for an application blank.

## CLASSES OF MEMBERSHIP

**Class A.** Sustaining members, being individuals or individuals delegated by corporations, firms, partnerships, etc., interested in the science and art of welding, with full rights of membership. Annual dues $100.00.

**Class B.** Members, being individuals interested in the science and art of welding, with full rights of membership. Engineers or individuals competent by experience or training to plan or direct welding operations are eligible to this class. Annual dues $20.00.

**Class C.** Associate members with right to vote but not to hold office, except in Sections as may be provided for by the By-Laws of the Sections. Supervising welders, inspectors and skilled operators, with three or more years practical experience in welding, are also eligible to this class. Annual dues, $10.00.

**Class D.** Operating members, who are welders or cutters by occupation, without the right to vote or hold office except in Sections as may be provided for by the By-Laws of the Sections. Annual dues $5.00.

## American Welding Society

**33 West 39th Street**

**NEW YORK, N. Y.**

# ROEBLING WELDING WIRE

CONFORMS TO THE SPECIFICATIONS OF THE AMERCAN WELDING SOCIETY

Roebling Welding Wire gives satisfactory service and demonstrates its efficiency and reliability. Exacting tests have proven that it possesses those qualities essential to good welding.

If you are not using Roebling Welding Wire, it amply merits your consideration.

Roeb'ling copyrighted trade-mark JAR stamped on each ELECTRODE

**JOHN A. ROEBLING'S SONS CO.**
TRENTON NEW JERSEY

## K-G Welding& Cutting Company, Inc.

**556 WEST 34th STREET**
NEW YORK CITY
MANUFACTURERS OF
**K-G-TORCHES**

*BOUND VOLUME*
*1922 Journal*
*AMERICAN WELDINIG SOCIETY*
*A Few Still Left*
*May be obtained by writing to the*
*Secretary*
*$5.00 PER COPY*

# ACETYLENE IN PORTABLE CYLINDERS FOR OXY-ACETYLENE WELDING AND CUTTING

**Do you understand our free loan cylinder plan? If not, We are glad to explain**

*Supplied in the following size cylinders:*

| | | | |
|---|---|---|---|
| 10″ x 30″— | capacity | 125 | cu. ft. |
| 12″ x 36″— | " | 225 | " " |
| 12″ x 44″— | " | 275 | " " |

Prompt and efficient service on any quantity through plants and warehouses and truck deliveries.

## Commercial Acetylene Supply Co., Inc.

**(Main Office) 80 Broadway, New York City, N. Y.**

BRANCHES:

421 Trust Co. of Georgia Bldg., Atlanta, Ga.
80 E. Jackson Boulevard, Chicago, Ill.
553 Monadnock Bldg., San Francisco, Cal.

# Take the GUESS WORK Out of Welding

IN YOUR PLANT there is a man who needs timely and accurate information about welding. He should know what is being done in other plants to reduce costs and increase efficiency. No matter what your welding problem may be, The Welding Engineer is the best source of information, the best adviser you could have. Every phase of welding, both manufacturing and repair problems, is discussed fully in this valuable monthly publication. The best authorities in America on the subject of welding are regular contributors.

Every process of welding is discussed by The Welding Engineer. Arc Welding, Electric Butt, Spot and Seam Welding, Oxy-Acetylene and the Thermit System, in fact every known process of joining metals is discussed. Its Buyers' Index reflects the progressiveness of America's first manufacturers.

L. B. MACKENZIE, Editor H. S. CARD, Associate Editor

**Price $3.00 in the United States and Canada; $4.00 Abroad**

*Write for free sample copy for convincing proof that The Welding Engineer is indispensable in your business.*

Member Associated Business Papers, Inc.

## The Welding Engineer

Member Audit Bureau of Circulations

608 S. DEARBORN STREET, CHICAGO

GIBB WELDING SERVICE

EMBRACES

*First*—A complete line of Electrical Welding Equipment, making possible the best type machine for the job taking all facts into account. There are cases when either an arc or a spot welder might be used; an arc or an automatic arc; an automatic arc or an automatic seam. Gibb Welding Service advises that which is most applicable.

*Second*—Sales Engineers who quickly recognize the nature of a job, and who from experience and an intimate knowledge of our complete line are in a position to determine the best solution.

*Third*—An up-to-date factory capable of following out the ideas of the engineer and his client

*Fourth*—Installation Engineers of experience with welding machines and their application to production.

*Tell us what you want to weld—let us give you the benefit of our experience.*

GIBB INSTRUMENT COMPANY

BAY CITY, MICH.

| PHILADELPHIA | DETROIT | CLEVELAND | CHICAGO |
|---|---|---|---|
| 521 Arch Street | Gen. Motors Bldg. | 2104 Superior St. | 428 Peoples Gas Bldg |

*For Welding High Carbon Steel--*

# PAGE HIGH CARBON ELECTRODES

| HARDNESS ANALYSIS (SCLEROSCOPE) | |
|---|---|
| No. 1 (Original Metal) | 30 |
| No. 2 | 31 |
| No. 3 | 31 |
| No. 4 | 32 |
| No. 5 | 35 |
| No. 6 | 35 |
| No. 7 | 37 |

THE maintenance and reclaiming of High Carbon Steel parts by welding can best be accomplished by use of suitable welding metal. The data presented herewith is typical of results secured with Page High Carbon Gas Welding Rods, and indicates qualities more than equal to the original metal.

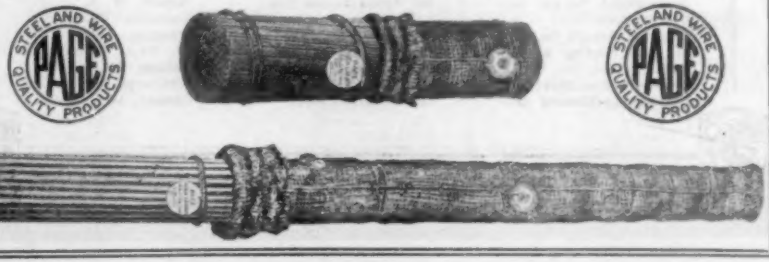
**Conform in all respects to A. W. S. Specifications, E-No. 1C.**

*Look for Red Tag and Red-Colored Ends.*

PAGE STEEL AND WIRE COMPANY

BRIDGEPORT, CONN.

CHICAGO NEW YORK PITTSBURGH SAN FRANCISCO



*THERE IS NO SUBSTITUTE FOR SAFETY*

# Welding Costs

Welding costs are determined by the performance, not the initial cost, of welding equipment. This fact has been proved again and again by welders who have used cheap equipment in the belief that it was "just as good." Now they are using REGO, and saving in gas consumption, time and worry.

**REGO equipment is made for the people who are tired of the expensivness of cheap equipment.**

***Distributed Nationally By***

| | | |
|---|---|---|
| Kentucky Oxygen Hydrogen Co., | Logan St. & Goss Ave., | Louisville, Ky. |
| Weldex Equipment Co., | 3 Millard Ave., | N. Tarrytown, N. Y. |
| International Oxygen Co., | 706 Frelinghuysen Ave., | Newark, N. J. |
| Gas Products Co., | | Columbus, Ohio. |
| Memphis Oxygen Co., | 682 So. Main St., | Memphis, Tenn. |
| St. Paul Welding & Mfg. Co., | 174 W. Third St., | St. Paul, Minn. |
| Acme Oxygen Co., | Pershing Road at Racine Ave. | Chicago, Ill. |
| Welderaft Equipment Co., | 2723 Liberty Ave., | Pittsburgh, Pa. |
| The Bastian-Blessing Co., | 125 W. Austin Ave., | Chicago, Ill. |

# LINCOLN ARC WELDER

## The Cost of Arc Welding

Labor is the big item in the cost of arc welding.

The welding equipment which will enable the welding operator to do the most work per day, is the cheapest equipment to buy, no matter what its original cost.

A slight difference in cost of equipment can have no weight whatever compared to the amount or work which the machin will turn out.

As a matter of fact the Lincoln Arc Welder will pay for itself in far less than ten years by the extra amount of work it will do over any other type of equipment.

## THE LINCOLN ELECTRIC COMPANY

**General Offices and Factory, Cleveland, Ohio**

**THE LINCOLN ELECTRIC CO. OF CANADA, LTD., TORONTO-MONTREAL**
**European Representatives, ALLEN LIVERSIDGE, LTD., LONDON**

**Branch Offices**

Boston
Buffalo
Charlotte, N. C.
Chicago
Cincinnati
Detroit
Fort Worth, Texas
Los Angeles
Minneapolis
New York City
Philadelphia
Pittsburgh

Essentials for Safe and Reliable Electric Arc Welding

**WANAMAKER COATED ELECTRODES and TECOR ACCESSORIES**

*Write for Booklet*

**Transportation Engineering Corporation**

15 PARK ROW
NEW YORK

327 SO. LA SALLE STREET
CHICAGO

**TORCHWELD Non Flash APPARATUS**

**FOR WELDING AND CUTTING OF METALS**

Hand and Machine Torches in proper sizes for all Welding and Cutting requirements.....
Acetylene Gas Generators. Gas Pressure Regulators. Lead Burning, Brazing, Soldering and Decarbonizing Outfits. Welding Supplies and Accessories.

**TORCHWELD EQUIPMENT COMPANY**

224 NORTH CARPENTER STREET CHICAGO, ILLINOIS

**ACETYLENE FROM CAKES**

Carbic low pressure, portable generator. Weight charged—200 lbs. Listed as standard by Fire Underwriters' Laboratories.

The most modern, efficient and safest source of acetylene supply—Carbic CAKES.

Not an experiment. Hundreds of Carbic generators using Carbic are in daily use on all kinds of welding and cutting work.
The use of Carbic Cakes permits an ease of handling, a convenience and a safety not otherwise obtainable.

THE Carbic SYSTEM

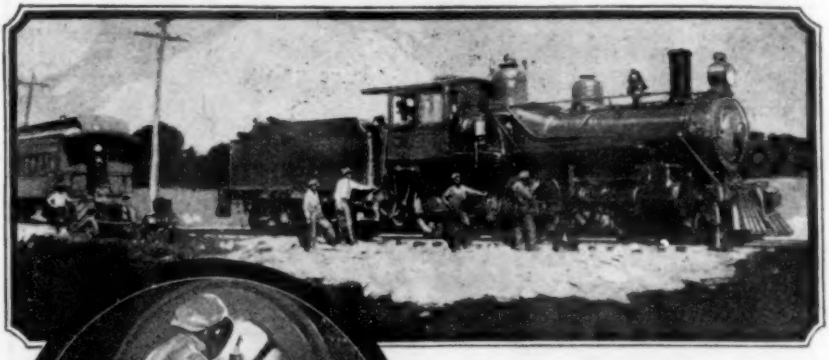
Acetylene from Carbic costs less than one-half as much as compressed acetylene and only a few drums of cakes carried in stock insure a large supply of gas on hand at all times.

**CARBIC MFG. CO.**

Duluth, Minn. New York, 141-149 Centre St.
Boston, 27 School Street Chicago, 565 W. Wash. Blvd.
The Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colorado.
Woodward, Wright & Company, New Orleans, La.

*Offices and Representatives in other principal Cities*

# They've Been Welding on the Railroad



This is a drawing from an actual photograph showing the broken frame of a locomotive that is being repaired with a Westinghouse arc-welding outfit — not in the shops but on the right-of-way

## Electric Welding

### Saves Time — Money — Material

A broken frame stopped this locomotive and threatened a trip to the shops, a disorganized schedule, a long delay for passengers and express matter, and a cost that would have been very serious.

But a Westinghouse salesman happened along!

After that, it was only a matter of a few hours till the train was on its way again; the frame *permanently* and *properly* repaired by a portable welding set which had been operated by the same tractor that drew it out from a nearby town. Just think about that a minute!

What do they do in *your* business? Do they weld, or do they wait? Do you, and your plant people, know of the great advantages that electric welding would bring to you? Perhaps you have no idea of the value of the machines and parts that are scrapped or laid up every year just because arc-welding isn't known, or its practical uses understood.

Westinghouse makes arc-welding apparatus for every purpose including a one-man set that can be *taken to the work*. And every manufacturer ought to know of their possibilities for there are few plants in which they will not quickly pay for themselves. Our nearest office will gladly tell you the interesting facts about them.

WESTINGHOUSE
ELECTRIC & MANUFACTURING COMPANY
*Offices in all Principal Cities · Representatives Everywhere*

© 1923 W. E. & M. Co.

# Westinghouse

1923 W. E. & M. Co.

## PREST-O-LITE PRE-EMINENCE

THE result of sincere, unceasing effort, backed by the essentials of success, to establish and maintain purity of product and dependability of service, available *always* where there exist demands for dissolved acetylene—55 plants and warehouses *at your service.*

Baltimore
Kansas City
Los Angeles
Pittsburgh
Buffalo
Milwaukee
Chicago
Cleveland
Atlanta

**Prest-O-Lite**
DISSOLVED ACETYLENE

New Orleans
New York
Seattle
San Francisco
Dallas
Philadelphia
St. Louis
Boston
Detroit

THE PREST-O-LITE COMPANY, INC.
General Offices: CARBIDE AND CARBON BUILDING, 30 EAST 42nd ST.
NEW YORK
ADDRESS ANY DISTRICT SALES OFFICE LISTED ABOVE

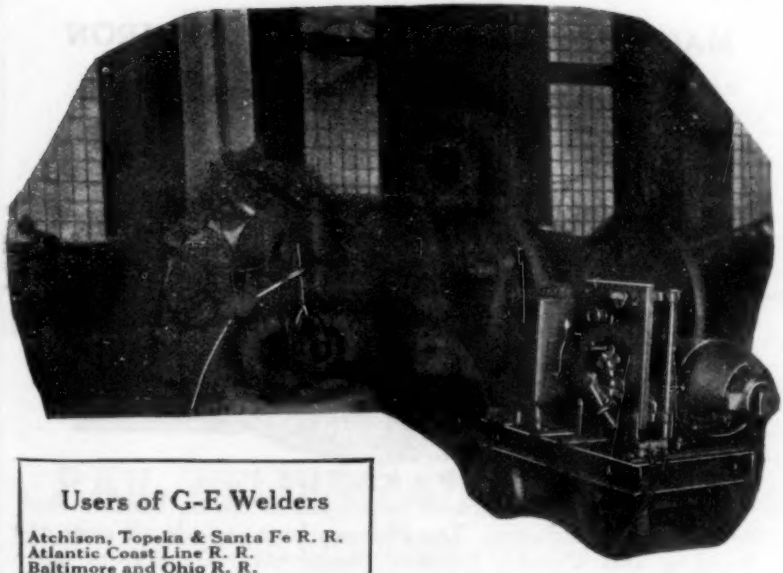
# Oxweld Can Do It!

*A Slogan Built on Performance*

OXWELD ACETYLENE COMPANY

SAN FRANCISCO
CHICAGO
LONG ISLAND CITY

WORLD'S LARGEST MAKERS OF OXY-ACETYLENE EQUIPMENT



## Users of G-E Welders

Atchison, Topeka & Santa Fe R. R.
Atlantic Coast Line R. R.
Baltimore and Ohio R. R.
Big Four R. R.
Canadian Pacific R. R.
Central New England R. R.
Central Railroad of New Jersey.
Chicago, Milwaukee & St. Paul R. R.
Colorado and Wyoming R. R.
Denver and Rio Grande R. R.
Detroit and Mackinac R. R.
Eastern Kentucky R. R.
Grand Trunk R. R.
Grasse River R. R.
Gulf, Colorado and Santa Fe R. R.
International & Great Northern R. R.
Lehigh Valley R. R.
Los Angeles and Salt Lake R. R.
McCloud River R. R.
Michigan Central R. R.
Missouri and Texas Rwy. of Texas.
Missouri, Kansas and Texas R. R.
New York Central R. R.
New York, Chicago and St. Louis R.R.
New York, New Haven & Hartford R. R.
New York, Ontario and Western R. R.
Northern Pacific R. R.
Panhandle and Santa Fe.
Pennsylvania R. R.
Seaboard Air Line R. R.
Southern Pacific R. R.
Ulster and Delaware R. R.
Union Pacific R. R.
Virginian Ry. Co.
West Virginia Northern R. R.
Western Pacific R. R.

## A Recommendation

Worth-while savings are being effected by leading railways thru the successful use of G-E Welders. The Santa Fe finds G-E Electric Welding Equipment so much to its liking that this railroad is using over 80 G-E Welding Sets.

G-E engineers have thoroughly studied the application of electric welding to the various needs of railroad shops, roundhouses, etc.—and have developed several types of welding equipment to accomplish the work required.

For complete welding service the General Electric Company offers single-operator and multi-operator units, portable and stationary, also semi-automatic and full automatic welders. Ask the nearest G-E Sales Office for complete information.

**General Electric Company**
**Schenectady, N. Y.**
**Sales Offices in all Large Cities**

# GENERAL ELECTRIC

43B-796D

## MACHINEABLE WELDS ON CAST IRON

**have been accomplished the world over with Wilson Color-Tipt Welding Metal Grade No. 12. — — — — Why not for you?**

## WILSON WELDER AND METALS CO.

**132 KING ST., NEW YORK**

WELDING MILBURN OXY-ACETYLENE CUTTING

## APPARATUS

The result of research and development dating back to the infancy of the industry. The Milburn Line include all sizes of Welding and Cutting Torches, Regulators, Generators and Complete Acetylene Compressing Plants.

**THE ALEXANDER MILBURN COMPANY**

**1416-1428 W. Baltimore Street** **Baltimore, Maryland**

# *Swedox*

## Welding Rods and Wires

| | | |
|---|---|---|
| LEKTROX SWEDOX | NICKOX | CYLKOTE |
| NONOX SWEDOX | KROMOX | MANKOTE |
| ARC CARBOX | RAILOX | TOBIN BRONZE |
| GAS CARBOX | MANGANOX | BRAZOX |
| CASTOX | STEELKOTE | BRONZOX |
| VANOX | LEKKOTE | MANGANESE BRONZE |
| | ALUMINOX | |

**The above list of Welding Rods covers the American Welding Society's Specifications E-No. 1A, E-No. 1B, E-No. 1C, G-No. 1A—Folio Nos. 1-E and 1-G, and a large variety of other analyses developed by us for special purposes.**

**Put your welding problems up to our experts—(Demonstrations will be made wherever possible.) Free samples of any rod sent upon request.**

**Chicago Office and Warehouse**
127 North Peoria St.
CHICAGO, ILL.
Phone Haymarket 7400

Central Steel & Wire Company

**Detroit Office and Warehouse**
Bellevue & Warren Aves.
DETROIT, MICH.
Phone Melrose 4032

# UNA Rail Bonds

## A Path of Copper from Rail to Rail

The installation of UNA Rail Bonds is the simplest and quickest method of bonding. A weld of the all copper bond is made direct to the steel rails. In this way, copper alone carries the current from rail to rail. Thus maximum power savings result and the full value from bonding is obtained.

*Investigate UNA Bonds now—they save money*

**RAIL WELDING & BONDING CO.**

**CLEVELAND, OHIO**

## PROGRESS IN WELDING

To progress in welding you must be a reader of the Acetylene Journal—a monthly magazine, now in its 25th volume, devoted to oxy-acetylene welding and cutting.

Its articles are interesting, instructive and well illustrated. Contributed to by men of experience in all the different branches of the industry. Each issue contains information you can not afford to be without.

A request will bring you a sample copy, which will prove that the Journal should be a part of your equipment.

Price $2.00 in the United States and Canada.
Foreign $3.00.

STUART PLUMLEY, Managing Editor

**ACETYLENE JOURNAL**

122 So. MICHIGAN AVENUE, CHICAGO, ILL.

**All books on gas welding may also be obtained through this office, including the famous "Autogenous Welding" by Granjon & Rosemberg (price $3.00), for which this office has the exclusive American rights.**

**Service for New England on Welding Wire Requirements**

**ARMCO WELDING WIRE**

**In Boston Stock**

FOR ELECTRIC WELDING
*Armco Blue Label* in 14 inch lengths.
On reels for G-E Automatic Welding Equipment

FOR GAS WELDING
*Armco Yellow Label* in 36 inch lengths.
Also Cast Iron, Tobin Bronze, Alum, etc.

**P. F. McDONALD & COMPANY**

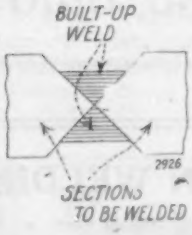
STEEL

17 KING TERMINAL — All Grades and Finishes — BOSTON 27, MASS.

THERMIT WELDING

*Best adapted for Heavy Sections because shrinkage strains avoided.*

A "BUILT-UP" WELD — Shrinkage of layers resisted by those already solidified, tending to cause strains and failure.



A THERMIT WELD — Made in one operation. Only one shrinkage which can be allowed for in advance.

**METAL & THERMIT CORPORATION**

120 BROADWAY, NEW YORK

BOSTON PITTSBURGH CHICAGO TORONTO SO. SAN FRANCISCO

"THE UNIVERSAL WELDING MACHINE"

ARE YOU AWARE that our machine can be made to operate from any INDUSTRIAL POWER SUPPLY A. C. or D. C.

Electric Arc Cutting & Welding Co.

152-56 JELLIFF AVE., NEWARK, N. J.

# Electric Arc Welding Equipments

Properly designed for dependable service.
Self contained, require no exciter.
Stable Arc gives excellent penetration.
Positive control of current throughout entire range of machine.
Moderate speed insures long life.
We invite inquiries on all matter pertaining to Electric Arc Welding.

**Send for Bulletin No. 127**

## BURKE ELECTRIC CO.

*Manufacturers of*

**ELECTRIC WELDING OUTFITS**
**and**
**ELECTRIC MOTORS AND GENERATORS**
**FOR ALL PURPOSES**

**MAIN OFFICE AND WORKS, ERIE, PA.**

**Service-Sales Offices**

*New York* — *Detroit* — *Philadelphia*
*Pittsburgh* — *Cleveland* — *Buffalo*

**Sales Agencies**

*Kansas City*
W. T. Osborn

*Cincinnati*
Underwood Elec. Co.

*Milwaukee*
Fred H. Dorner

*Chicago*
Western Welding & Equip. Co.

*San Francisco*
Coast Equipment Co.

AIRCO

DAVIS APPARATUS

# Anything and Everything

## For Oxyacetylene Welding and Cutting

SERVICE

ECONOMY

**Public faith in a product is a reflection of faithful performance. Thus, consistently, have Airco Oxygen and Airco Acetylene built up good-will.**

## AIR REDUCTION SALES COMPANY

**Manufacturer of Airco Oxygen and Airco Acetylene and other Airco and Airco-Davis-Bournonville products—Controls the Manufacture and Sale of National Carbide.**

*Air Reduction Sales Company maintains its own Apparatus Repair Shop in each Airco District Office city.*

**Home Office: 342 MADISON AVE., NEW YORK, N. Y.**

Airco District Offices, Plants and Distributing Stations conveniently located thoughout the Country.

"Airco Oxygen and Acetylene Service is Good Service"